



INFANT MORTALITY IN INDIA  
1901-55

BY S. CHANDRASEKHAR  
HUNGRY PEOPLE AND EMPTY LANDS  
POPULATION AND PLANNED PARENTHOOD  
IN INDIA

# Infant Mortality in India 1901-55

A MATTER OF LIFE AND DEATH

BY

S. CHANDRASEKHAR

Director, Indian Institute for Population Studies, Madras  
and Visiting Professor of Demography  
University of Missouri, Columbia

WITH A FOREWORD BY

PROFESSOR PHILIP M. HAUSER

University of Chicago

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## FOREWORD

IN the preparation of this book dealing with a very large problem, Professor Chandrasekhar manifests his continued concern with the population problems that beset India. In focusing on infant mortality he is directing attention to a sore problem in all of the economically under-developed lands of the world. In a recent report of a United Nations Committee of Experts on *International Definition and Measurement of Standards and Levels of Living* (1954), the infant mortality rate is listed as one of the important indicators of the level of living of a people. So much is high infant mortality a concomitant of low levels of living that, in the absence of direct measurements of economic activity, the infant mortality rate may be taken as an index of the relative economic development of a nation. It is, in fact, a measurement of the extent to which the total milieu — environmental, economic, cultural, social and personal — affects not only varying levels of living but, also, differences in the preservation of life itself.

Professor Chandrasekhar's treatment of the problem of infant mortality in India leads him to a consideration of three topics. The first relates to the availability of information about it; the second to the known facts on its magnitude and causes; and the third to policy and action designed to reduce it.

The availability of statistics about infant mortality and its measurement are the concern of the first two chapters, or about half of the volume. The patent deficiencies of the data about infant mortality in India are accounted for by the shortcomings of the vital registration system and census agencies and procedures. The absence of adequate statistical information is one of the handicaps not only of India but, also, of economically under-developed areas throughout the world. With the limited resources of the less developed areas, data may be expected to remain inadequate for some time. For the establishment of an effective vital registration system and adequate census instrumentalities and procedures must compete for funds with the substantive programmes and facilities organized to ameliorate or eradicate the problems which the data would be designed to reveal. Fortunately, as Professor Chandrasekhar indicates, it is not necessary to await highly precise data to deal with infant mortality. Enough is already known about its magnitude and antecedents to initiate and to conduct programmes to control it.

The 'facts' about infant mortality in India in relation to other parts of the world are presented in Chapters III and IV. The level of infant mortality in India, while declining, is still inordinately high compared with the more economically advanced nations. Professor

Chandrasekhar's classification and discussion of the complexes of causes of infant mortality, namely the 'biological', the 'cultural and social', and the 'medical and pathological', even if found deficient in some respects, are exceedingly useful for framing the policies and programmes to which he refers at the end of his study. The 'causes' of high infant mortality in India are ascribed to indigenous cultural and social practices, as well as to biological factors and the conditions and practices associated with extreme poverty. Especially noteworthy are the materials on Indian customs, including the role of the midwife, which although understandable as part of the social heritage vested with the sanctity of tradition, sentiment and religion, will strike many readers as deplorable and point up the great need for general education in India.

In his final chapter Professor Chandrasekhar presents his conclusions and recommendations. In addition to pleading for better data, he stresses as important in the reduction of infant mortality widespread family planning, antenatal supervision, control of midwifery, postnatal care, vaccination, 'mothercraft', and pediatric services. He is mindful of the fact that the Government of India is attempting to reduce infant mortality and he quotes from the first and second five-year plans' discussions of the problem. He is aware that the reason why more has not been achieved in the reduction of infant mortality is 'lack of resources'.

Professor Chandrasekhar indicates in his Preface that he is 'more interested in policy and setting things right than in a mere dissertation on the problem'. Moreover, his objective is to draw some 'obvious and indisputable' conclusions. It is beside the point to observe that his conclusions and recommendations will not be universally regarded as 'obvious and indisputable'. For I am sure that he will consider that he has contributed towards his goal of helping wage war against high infant mortality in India even by stirring up discussion of his proposals. Consideration of the problem and of alternative solutions to it is a prerequisite to the formulation of policy and the implementation of policy designed to reduce infant mortality.

In concluding this Foreword, it is necessary to refer to an aspect of reduced mortality in the economically under-developed areas of the world which poses a new and emergent problem. In the experience of the economically more advanced nations, reductions in mortality, including infant mortality, were the result of many factors, including increased productivity and attendant higher levels of living. At the present time, as a result of advances in medicine, especially the development of chemo-therapy, it is possible to effect great reductions in mortality in relatively short periods of time without simultaneous increases in productivity.

The world is faced, therefore, with the prospect of rapidly decreased mortality, and consequently greatly increased rates of population growth, while relatively little increase occurs in productivity. Situations of this type are already visible in a number of areas, including India's neighbour, Ceylon. That such a combination of conditions cannot long endure is clear. Gains in infant mortality or total mortality, resulting in sharp population increases, may be costly gains. For rapid population growth without corresponding gains in productivity will inevitably lead to even lower levels of living than those which already obtain in the under-developed areas.

The reduction of mortality, including infant mortality, must, therefore, be approached in the context of general economic development and control of fertility and, hence, population growth. Only if economic development outruns population growth can gains in mortality result in, and be an index of, higher levels of living. Otherwise it is possible that infant mortality gains in the under-developed areas will be short-lived. They may conceivably even create more severe problems than those they were designed to eliminate.

PHILIP M. HAUSER

University of Chicago  
U.S.A.  
March 1958



TO MY WIFE

## PREFACE

THIS book is the result of a research inquiry carried out by me as a Nuffield Foundation Fellow in the London School of Economics, University of London, for two years from November 1953 to November 1955.

When I was appointed a Nuffield Fellow in Indian Demography I was given an opportunity to inquire into some aspect of India's population problems. And out of the many possible subjects in the field of formal demography, that of Infant Mortality in India was chosen because, first, no book had ever been written on the subject and, secondly, the matter deserved serious attention from the point of view of practical policy. The importance of the subject, particularly in an under-developed country which is embarking on major planned economic and social change, cannot be over-emphasized. Hence this demographic, economic, sociological and statistical survey of Infant Mortality in India during the last half a century.

When the available literature was studied and the data assembled, two approaches presented themselves for preparing this study. One was to make a severely technical and fundamentally statistical study, refine and adjust the past rates and reveal possibly how much higher actually the magnitude of Infant Mortality was and is in India. Such an approach could only be addressed to fellow demographers and other social scientists and would remain merely an intellectual exercise. The second approach was to outline the problem on the basis of the given, albeit crude, data, measure its size, analyse the component parts and outline a practical policy. This approach could be addressed to the intelligent reader, the patriotic citizen and those in authority. The second approach has been adopted without sacrificing, I hope, the scientific validity of what is said. The problem of Infant Mortality in India has been outlined in its international context and a policy suggested to solve it, despite the serious areas of ignorance of the subject in India. I have attempted nothing more.

But I am aware of the fact that this study is, to some extent, an analysis of suppositions and a dissection of uncertainties. All that I have done is to assemble what is available, indicate its worth and draw some obvious and indisputable conclusions. Frankly, I am more interested in policy and setting things right than in a mere dissertation on the problem. If the work is read by those in authority in India, particularly the Ministry of Health of the Government of India in New Delhi and the Medical and Public Health Departments of the various State Governments, and as a result, if someone is roused to more serious action, I shall feel amply rewarded.

During my two-year Fellowship I had occasion to visit various

British universities and confer with a number of workers on the subject. They ranged from anthropologists and demographers to gynaecologists, obstetricians, pediatricians and medical statisticians. I wish to record my grateful thanks to the following scholars who found time to discuss with me some point or other pertaining to the subject: Professor Thomas McKeown and Dr. J. R. Gibson of the Department of Social Medicine, University of Birmingham; the late Sir James Spence and Dr. F. W. Miller of the Department of Child Health in the King's College, University of Durham, at Newcastle upon Tyne, and Mrs. Margaret Burns of the same city; Professor C. Fraser-Brockington and Mr. John Hajnal of the Department of Preventive and Social Medicine, Manchester University; Dr. J. W. B. Douglas, Dr. Barnett Wolf and Dr. Lily Stein of the University of Edinburgh; Professor Dugald Baird, Regius Professor of Midwifery, and Dr. Angus Thompson of the University of Aberdeen. In London, Dr. J. N. Morris and Mr. J. H. Heady of the Social Medicine Research Unit, Middlesex Hospital, and Professor D. V. Glass, Professor R. M. Titmus and Mr. N. H. Carrier of the London School of Economics were helpful.

I also had an opportunity during the tenure of my Fellowship to visit several workers in the field outside the United Kingdom, in Sweden, Norway, Denmark, France, Italy, Canada, the United States of America and Japan. Dr. V. G. Valaoras of the United Nations in New York and Professor J. Yerushalmy of the Department of Public Health, University of California, at Berkeley, have been helpful.

My gratitude to the Nuffield Foundation is obvious. I am particularly grateful to Mr. Leslie Farrer-Brown, Director of the Foundation, whose courtesy and helpfulness have made the writer's sojourn in England so enjoyable. Brigadier Christopher Huxley of the Foundation extended to me every possible kindness and I am very much indebted to him. Among others on the Foundation staff who have been particularly helpful are Miss Macdonald, Mrs. Dolly Douglas, Miss Margaret Wheatley and Miss Ratcliffe.

I am indebted to Lt.-Col. Sangham Lal, Director of Medical Services and Dr. Mabel Sharma, Deputy Director of Public Health, Government of Madras, and Professor W. F. Kibble of the Madras Christian College, and Mrs. Edith Ford, for various suggestions.

I am thankful to Dr. K. C. K. E. Raja of the Ministry of Health, for his kindness in sending me some official Indian data on infant mortality, and Shri P. S. Menon of the United Nations, New York, who supplied some U.N. data on the subject. I am deeply indebted to Professor Philip M. Hauser of the University of Chicago for his kind Foreword.

More than anything, I am particularly grateful to my wife's unfailing patience and assistance. She has revised the manuscript, made numerous suggestions and has seen the book through the press.

S. CHANDRASEKHAR

Indian Institute for Population Studies

Madras

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## INTRODUCTION

THIS study is an attempt to survey the level, causes and course of Infant Mortality in India during the last half a century.

All the available and acceptable material on Infant Mortality in India during the period under review has been assembled to evaluate the range and magnitude of infant deaths, their causes and possible solutions. The nature, worth and value of the source material for the study have been examined in some detail, largely in the light of official reports and evaluation. While this examination may appear to be too detailed, it has been found necessary to indicate what kind of tools are available for the task that has been undertaken. In a sense, this examination is most important, for the weaknesses and strength of the sources are reflected in the study. The cleanliness and purity of the stream are largely conditioned by circumstances at the source. The variegated evolution of the source material and the barrage of official and unofficial criticism to which it has been subjected through the years have been outlined. If the resulting statistical record has not improved, it can only constitute a sad commentary both on the cussedness of Indian administration and the lack of civic consciousness and statistical sense on the part of the people.

Despite obvious limitations, much reliance has been placed on official material, supplemented whenever possible by unofficial data, where such data have been found to be reliable. And where there is no direct evidence, one can only rely on opinions in the hope that they are expert ones. But opinions in such demographic matters as fertility and mortality can sometimes be notoriously misleading. As for customs, habits and manners, the entire cultural ethos and its abiding impact on matters of life and death, expert data have been more easily available, for here cultivated observation can be largely relied on.

The last half a century has been chosen as the period of study for various reasons. First, it is a long and yet not too long period wherein trends can be observed better than in short intervals of time. Secondly, trends are important because of the defectiveness of the available statistical material, where specific annual totals and rates in births or deaths do not have much significance. While surveying and establishing trends, fifty years constitute a convenient stretch of time.

Thirdly, the political evolution of the country from complete dependence on an alien administration and rule to full political freedom and responsible administration fits into the chosen period. The political aspect is important, for the advance of public health, preventive medicine and economic development are to a large extent

conditioned by the political status of a country. The population dynamics of a country are considerably affected by such factors as peace, political freedom and the blessings these can confer, which in turn may provide an opportunity for economic advancement, social progress and cultural regeneration.

The long fight, apparently never wholehearted, against this unnecessary and tragic loss of infants has been outlined. And some suggestions — educational, economic, medical and cultural — which are easier advocated than implemented, for an effective attack against the unnecessary and premature deaths of these infants, have been offered. Some indication is given of the progress and achievements in certain advanced countries and some hope is expressed that what is possible elsewhere should be possible in India also, given more or less similar circumstances.

The importance of an inquiry into all vital losses up to the age of one year is obvious. First, the infant mortality rate is a sensitive index of the total cultural *milieu* of a community or a country. It reflects the state of public health and hygiene, environmental sanitation, cultural *mores* about feeding and clothing, socio-economic development and the stage of the arts, and above all, the people's attitudes towards the dignity and value of human life itself. No simple statistical index conveys so much so effectively as the infant mortality rate.

Secondly, the magnitude and range of Infant Mortality are equally important for their effect on the future growth of population in countries where the population numbers are problematic in the sense of too many or too few in relation to the total set of relevant economic and social factors. A country which is under-populated or has a stabilized birth rate cannot afford to lose more than the minimum and unavoidable number of infants. And countries which are faced with too many people, with the problem of pressure of numbers on the available, limited resources, are bound to look at high infant mortality, no doubt unconsciously, with a certain amount of detachment and want of concern. It is not an accident that countries with considerable population pressure and with under-developed economies have high infant mortality rates. And they are discovering that even a nominal reduction of such mortality levels is bound to add more to their net annual additions of population.

And here is an ethical dilemma. Every infant's life which can be saved, and today about ninety-five per cent can be, must be saved. The right of a newborn baby to the longest possible longevity can never be questioned in any culture. But then, if more babies are born, more babies are likely to and do die. Therefore, an effective reduction of infant mortality seems to imply and involve a reduction

of total births. A purposeful control of infant deaths and mortality in other age groups unaccompanied by a conscious control of fertility seems to be meaningless in the economies of many underdeveloped countries. In other words, a fall in the birth rate must, in ordinary circumstances, lead to a fall in the first-year death rate, since infant deaths make a heavy contribution to total mortality. Thus, for these two reasons, a country must watch over its total number of births and also ensure that as many births as possible flower into healthy and active adult lives for their own sake, if for no other reason.



## CHAPTER I

# Population Census and Vital Statistics in India

---

THE idea of conducting a periodical enumeration of people was not unknown in ancient times. Like other countries, all the way from Greece to Great Britain, India has a census history that goes far back into the mists of antiquity and offers a considerable variety in technique. It is but natural that in ancient India the rulers should have resorted to some kind of rough counting of the people or their households, if only to gauge the military strength of the country and possibly for purposes of taxation. We have some evidence to this effect. Kautilya's *Arthashastra* (circa 300 B.C.) gives us a glimpse of the high level reached in statistical matters in ancient India. The individual enumeration of occupation and production recorded by Kautilya was fairly advanced even by modern standards. Megasthenes, the Greek Ambassador to India about 300 B.C., came across men employed by Indian rulers to collect census and vital statistics.<sup>1</sup> In Mauryan times (325-188 B.C.) we are told that periodical enumeration of the people was common and that civic bodies regularly conducted such work.<sup>2</sup> There was also a system of registering births and deaths for the information of the Government. A few centuries later, when Indian civilization reached its heyday under the Guptas (A.D. 300-600), census operations were not merely periodical but had something in the nature of a permanent continuing activity.<sup>3</sup>

And some decades before the British gained supreme political control over India, several attempts were made to count the people of Madras, the then senior major presidency of India. In 1767, on the suggestion of the East India Company, which was rapidly becoming a quasi-political body, a rough computation of the number of people in the Madras Presidency was undertaken. But all these earlier and pre-British attempts were irregular and more or less devoid of scientific content. It is even doubtful whether they can be called census in the strict sense of the term.

The first attempt at a regular enumeration of the people, however,

<sup>1</sup> Narendranath Law, *Studies in Ancient Indian Polity* (London, 1914), p. 18.

<sup>2</sup> Vincent Smith, *Early History of India* (Oxford, 1924), p. 134.

<sup>3</sup> *Ibid.*, p. 134.

after the firm establishment of the Company rule was made in 1822 in the Madras Presidency. This was carried out on a form devised by the famous British administrator, Sir Thomas Munro. In fact, this form was devised by him as early as 1802, and between 1813 and 1815 three yearly counts were taken along with the determination of the land revenue.

It was, however, in 1849 that the Government of the East India Company contemplated a census of the people in all their then scattered possessions in India, and this was the earliest idea of a census beyond the frontiers of the then Madras Presidency. The suggestion was made for holding quinquennial counts of the population, and the Madras Government was the earliest to adopt the suggestion and thus pioneered the way. At least four such enumerations were carried out in the Madras Presidency before the Central Government took up the work and the provincial government's work became merged in the Imperial Census. With the experience of earlier enumerations, the Madras Government were quite confident of success, for they reported in 1871: 'There is nothing novel in the idea of a census in this Presidency and there is no reason to anticipate any difficulty in carrying out the wishes of the Government of India.' All these earlier attempts at counting the heads — the early census operations were no more than that — made whatever use they could of the existing administrative and other agencies, and this principle, to a greater or a lesser extent, has always characterized the Indian census.

The first 'all-India' but partial census took place in 1872, but the first regular, decennial census series began from 1881. The procedure and the machinery of enumeration in India have not changed very much since the first regular census of 1881 down to the decennial census of 1951, except to the extent made desirable by the accumulating experience that demands more and more data to meet the changing economic and social conditions and the growing, complex administrative machinery of the government.

*Census organization:* Today the census hierarchy in India begins from the top at New Delhi with the Registrar-General and Chief Census Commissioner. The post of a permanent Registrar-General was created in 1951 to take the place of a temporary, decennial appointment of the Chief Census Commissioner. Under him are the Census Superintendents in the various States of the Indian Union (these Census Superintendents are drawn for the most part from the Indian civil and administrative services). These posts are at present temporary and are usually created on the eve of the decennial census. Then, in descending order of importance, the District Officer, the

Sub-divisional or the *Tahsil* officer; the Revenue Circle-Inspector, the *Parghana* and so on and finally the Village *Chowkidar* or headman. Of this hierarchy, only the first two groups are whole-time census officers and the rest are either members of the already existing administrative machinery or temporary employees. When we come to the district, the main unit of administration in India, the census chain fits in with the administrative chain. Both authority and economy counsel this; the first because the immediate authorities recognized by the people are brought into the census as administrative heads. It follows in the administrative order of the District Collector (that is, head of the district), the *Tahsildar* (head of a *tahsil*) and so on. The second reason is that these officers serve as useful links in the census chain without any extra payment. Many of them are touring officers, who are expected to spend a certain portion of the year in travelling around the areas under their charge.

Thus, the census operation becomes a by-product of the existing administrative system, since the census department makes the maximum and best possible use of the tours and other activities of lesser administrative heads also. The principle of making the census chain coincide with the administrative chain is naturally extended to other fields. Thus Customs and Post Offices are in charge of dock enumeration and postal personnel; the Railway personnel furnish the census staff for railway premises; the Army and Navy authorities are in charge of enumerating soldiers and sailors; and so on. Special arrangements are made for the enumeration of the prisoners in jails, patients in hospitals, sanatoria and asylums and of travellers by boat, road, rail or air. There are a few exceptions, of course, but they affect only a very small proportion of the country's population; for example, in certain tribal areas, where administration rests lightly and no competent literate residents are found, enumerators are sent in from outside to count the people of such tribal areas. These enumerators are paid, practically the only enumerating personnel who are.

Thus the Indian census is a *de facto* census. It aims at a synchronous enumeration of all the people wherever found on a particular day and at a particular time, whether they are permanent residents or transient visitors. It is thus a total count of the actual population of a given area making no separate provision for the fluctuations caused by internal migration. However, if necessary the *de jure* population can be roughly estimated from the approximations arrived at at the time of preparing the house list.<sup>1</sup>

Regionally, the Indian census units, in ascending order, are block,

<sup>1</sup> The 1951 census deviated from this one-night count and spread the census over a few days.



circle, charge, *tahsil*, district and province or state. At the fourth item, as observed already, the census chain coincides with that of the ordinary regular administrative unit. Each village and town is divided into a number of blocks, each block consisting of twenty to thirty houses and sometimes more. Each of such blocks constitutes the 'beat' of an enumerator. And a number of such blocks make up a 'circle' which is in charge of a census supervisor. The houses in each block are numbered and visited by enumerators, and particulars are gathered by them in reference to the categories contained in the census schedule.

The 'circles' in their turn are combined into 'charges' which in rural areas correspond to a revenue *firka*, while each urban 'area' is constituted into a separate 'charge'. The work in each 'charge' is looked after by a Superintendent. In those parts of India where the administrative system recognizes such a feature as a revenue inspector in charge of a particular area (this is so for example in the States of Madras and East Punjab) this revenue inspector or *Kamungo*, or whatever he is called, will be a 'charge' superintendent.

Thus the district is generally taken as the unit of the census, with the district collector (who is the administrative head) in charge. In the municipal areas, the Commissioner or the chief executive officer is put in charge of the work. In the village the *chowkidar*, whose office is often hereditary, looks after the work. The whole system resembles a pyramid of which the base is the individual enumerator in his block, which often corresponds to the village or a well-defined part of a town or a city, and the apex, of course, is the Registrar-General and Chief Census Commissioner in New Delhi.

The actual enumeration is a very elaborate and tedious process, for as a village enumerator once put it, the aim of the census is 'to catch every man and catch him once'. The first step in the Indian census (whose figures always relate to the spring of the first year in a decade, April 1951, for example) is the preparation of a list of villages and within each village a list of the houses. The village list might be said to be almost the same, census after census. But there is always the possibility of a new house or a colony springing up in a corner, and an old hut or a hamlet going out of existence. The exhaustive house list in each village is very important, for it serves as the basis for the enumerator when he goes on his counting rounds. This house list causes always some kind of difficulty, for the houses, especially in rural India, are neither permanent little independent brick-built cottages nor huge cement and iron apartment buildings. As mud walls and thatched roofs or discarded jute bags and tin sheets are all that is required to make a rural home, it is liable to appear and disappear with a frequency that is irritating to the census

department. The existence of this hut, home, house or habitation — it is called all these in census literature — is all the more uncertain when the *decennial* enumerator comes along. However, this is not so bad as it sounds, for in each village there is always the nucleus of more permanent structures, and the rural community being rather compact and existing in a well-defined geographical area, it is seldom that residential changes escape the notice of the village enumerator, who, as already pointed out, happens to be the permanent village *chowkidar*. Perhaps only those — and no one knows how many thousands there are — who live on the pavements with literally no roof above their heads escape the notice of the census enumerator.

For purposes of the census, the 'house' in India is defined in two ways. 'Where a structural criterion is taken,' says the Census Commissioner for 1921, 'a house is ordinarily defined with minor qualifications as the residence of one or more families having a separate independent entrance from the common way. Where the social aspect is looked into, it is defined as the home of a commensal family with its residents, dependants and servants.'<sup>1</sup>

While the social definition is more important than the structural one, three major provinces still retain the structural definition. The structural definition loses its meaning especially when it is remembered that there are people in India who have no houses in the accepted sense of the term, those who live and sleep on the pavements or in the public gardens. They are not necessarily beggars or vagrants but in some cases cart and rickshaw pullers and dock labourers. Despite these difficulties of defining a house in India, the year before the actual enumeration finds these house-lists being made all over the country from Kashmir to Travancore, the work being generally entrusted to those hardy standbys, the village officers, to whom sooner or later everything in India finds its way. According to Yeatts:

Every house where a human being may be found is given a number and that number has to be white-washed or painted on the door or displayed prominently in one way or another. Sometimes in the conical huts frequent on the Coromandel coast there is no surface that will take paint or wash and in such cases a number on a ticket is given to the occupant of the house. Each enumerator is given a list of the houses entrusted to him and it is these houses that he is to visit on his beat and these alone.<sup>2</sup>

In the 1951 census operations, each enumerator's record (answers

<sup>1</sup> *Census of India, 1921 Report* (New Delhi, Government of India Press, 1923).

<sup>2</sup> M. W. Yeatts, 'The World's Largest Census', *Asia* (New York), February 1941.

to census questionnaire) was taken down on slips supplied to him. This is a welcome departure, for in the previous censuses the enumerator had to take in all the details on a schedule as in the United Kingdom and the United States, which were later transferred to the slips. This departure from the conventional method saves time and labour. The enumerator is given a booklet in which instructions and questions to be asked in the enumerator's own language appear. And on the slips the numbers of the questions are printed with a blank space opposite to them for recording answers. This procedure minimizes to a considerable extent the difficulties presented by the want of a single common language in India.

When all the slips are filled up, they are sorted with indications as to their local origin. To complete this operation and minimize the enumerator's scriptory effort, a code system has been devised which is printed on the slips, and this reaches the enumerator in a permanent form. Under this code, the districts within each province or state are arranged with ascending serial number from the figure 1 in the order of their usual citation. Similarly, within a district, the *tahsils* are numbered, and similarly within a *tahsil*, the 'charges', and within a 'charge', the 'circle'. Every province and state in India has a district 1 and every district has a *tahsil* 1, and so on; and thus slips carrying a particular code number have a particular significance in every state in India, and the demands of every such unit can be run off at one stretch by the press.

Questions in the Indian census schedule, like any other census questionnaire, elicit information on familiar points of interest. Age, sex, civil condition, means of livelihood, birth place, mother tongue and literacy have been the usual items on which information is sought. The last but one census schedule, that of 1941, had widened the field by asking some twenty-two questions. The additions were regarding means of livelihood, information on fertility such as the age of the girl or boy at marriage, age of the mother at the birth of the first child, the number born and the number surviving.<sup>1</sup>

The 1951 census standardized the schedule which carried fourteen questions in all. They were: (1) Name and relationship to the head of the household, (2) Nationality, religion and special groups (like backward classes), (3) Civil condition, (4) Age, (5) Birth place, (6)

<sup>1</sup> The counting method followed in the 1941 census represented an important change from that adopted in the 1931 and earlier censuses. The method adopted and followed till the 1931 census was based on a synchronic overnight enumeration all over the country. This was considered unsuitable and even unscientific in a country with considerable climatic, social and regional variations. Instead of the one-night enumeration, the 1941 census count (with the aid of the house numbering system) became a count spread over a few days. This innovation gave the census authorities an opportunity for inspection and check of the count.

Displaced persons, (7) Mother tongue, (8) Bi-lingualism, (9) Economic status (employment and dependency), (10) Principal means of livelihood, (11) Secondary means of livelihood, (12) Literacy and education, (13) A question left to each provincial government to frame to elicit information on some subject of peculiar importance to the province concerned, and (14) Sex.

Thus, the latest 1951 census schedule departed from earlier schedules both in the number of questions asked and in the nature of the questions themselves. These changes were partly the result of the experience gained at the previous censuses. Some questions like information on caste have been deleted, thus reducing the total number of questions asked, and some questions have been made more precise. In view of the considerable illiteracy of the population and a lack of statistical sense even among the educated middle classes, a more ambitious schedule was found inadvisable.

Besides, the new schedule reflects the new political status of India. Free India is trying to evolve a democratic and secular state. As free India's constitution is a democratic one, and since caste and democracy are incompatible, the mere enumeration of castes has been dropped. It has been found that the mere labelling of people as belonging to this or that caste has been a factor in the perpetuation of the invidious system.<sup>1</sup> But as for the community to which a citizen belonged, the question has been strictly restricted to what is required for implementing the provisions in the new constitution relating to the scheduled castes, scheduled tribes and other backward communities, the uplift of which has become a serious concern of the new government.<sup>2</sup> Thus, as far as census enumeration is concerned, the backward communities have been enumerated in detail and all the non-backward communities have been lumped together, except for such other questions, which separate them under various categories. These changes are, no doubt, a welcome departure.

<sup>1</sup> The late Sardar Vallabhai Patel, while inaugurating, as Minister for Home Affairs, a conference of census superintendents in 1951, observed: 'Formerly there used to be elaborate caste tables which were required in India partly to satisfy the theory that it was a caste-ridden country and partly to meet the needs of administrative measures dependent on caste divisions. In the following census this will no longer be a prominent feature and we can devote our energies and attention to the collection and formulation of basic economic data relating to the means of livelihood of the people and other economic activities of the individual and the state.'

<sup>2</sup> The United States census, like that of some other Western countries, does not inquire into the religious affiliation of the citizen, as this may be interpreted as implied religious discrimination.

*Difficulties of the Indian Census*

Some of the difficulties and obstacles that confront the Indian census operations are obvious from the above description; they arise from human, geographical, administrative and cultural factors. While these are more or less common all the world over, some are peculiarly Indian in the sense that they are the outcome of the Indian social *milieu*.

Though the Indian people live in a well-defined geographical area, they are far flung and there are areas which are not easily accessible and rapid communications are not always easy. Despite the thread of cultural unity that runs through the entire population, the people are not close-knit and homogeneous. On the other hand, they are, by and large, a stay-at-home people and have exhibited very little mobility. Apart from a diversity in geological lay-out and climate, there are distinct cultural and sociological differences in customs and traditions among the various linguistic and religious groups. This situation is not only the result of existing ethnic diversity of the people but also the want of conscious efforts at 'Indianization' of the population and the absence of a wide, national network of roads and other means of travel which will enable Indians to travel freely all over the country, breaking down narrow and insular, linguistic and regional loyalties.

Secondly, literacy which provides the average citizen with a window to the outside world is still unfortunately a rare privilege in India. This leads to two difficulties. There is no awareness on the part of the citizen far removed from the nation's capital that the information sought in the census is badly needed by the government for serious administrative purposes, purposes which are ultimately dedicated to the interests of the citizen. Then there are not enough educated enumerators in every district all over the country. For instance, the census work in the frontier tribal areas presents real difficulties, as enumerators have to be imported from outside areas, and cannot always command local co-operation and support in their work. These sometimes present acute difficulties.

In the past, there have been 'political' difficulties in the path of the census enumeration. While these are now only of historical importance, the nature and extent of these barriers may be briefly indicated. In recent history, three census seasons have coincided with some major political crisis in the country such as the Non-Co-operation Movement of 1921, the Salt Civil Disobedience Movement of 1931 and the Individual Civil Disobedience Movement against participating in the Second World War in 1941 — all three *satyagrahas* sponsored and carried out by the Indian National Congress Party under the leadership of Mahatma Gandhi.

In 1921, due to the general political discontent arising directly from Mahatma Gandhi's freedom movement, census enumerators withdrew from work in sympathy with Gandhi's work in many centres. 'The real trouble arose when a certain misguided Bombay nationalist newspaper suggested the boycott of the Census since it was sponsored by the alien British Government. A few lost their sense of responsibility and destroyed some records thus creating a situation "far more serious than the political troubles".' Before this interference could gather strength, Gandhi, however, came out on the eve of the final enumeration and pointed out that Census was a matter of national utility in which all who wished might co-operate.

The Census of 1931 coincided with the second wave of Gandhi's Non-co-operation — this time it was the Salt March. Of this, Dr. J. H. Hutton, the Chief Census Commissioner for 1931, wrote:

The March of Mr. Gandhi and his contrabandists to invest the salt pans of Darsana synchronized with the opening of the Census operations. The blessing which he gave to the last Census (1921) at the last minute was at this time wanting. Although the people did not consider the Census so objectionable in itself, the opportunity of harassing the Government was too good to be missed.<sup>1</sup>

It must be added in fairness to the Mahatma that he was too busy with his celebrated March to the sea to break the salt law, to advise the people to co-operate with the Government Census officials. The failure to secure Gandhi's blessings on the part of the Census department resulted in the increased responsibilities of the enumerators. One of the commonest forms in which trouble arose was the effacement of the Census numbers on houses. It was not without recourse to the penal provisions of the law that the Census work was eventually completed.

In 1941, due to the individualist nature and much toned down character of the Civil Disobedience Movement, it being confined to a few thousands instead of millions, it did not hinder the Census operations. Despite the war conditions and the political deadlock in the country, the Census operations went off in a relatively peaceful atmosphere compared to those in 1921 and 1931. In 1951, the first Census in a free India, the country offered the fullest co-operation with the Census authorities in gathering the required data.

Other minor obstacles that beset the path of the Census enumerators in India arise from the nature of the family, caste, community life and the general low level of living of the people. The problems

<sup>1</sup> *Census of India, 1931* (New Delhi, Government of India Press, 1932), p. 82.

posed by mass illiteracy and the diverse and variegated pattern of Indian social life have been referred to already.

To appreciate these difficulties, it must be remembered that society in India, which is so fragmented and divided by so many limiting and divisive factors, is sociologically a fiction. Religion and language have created several cultural groups which in turn have been divided and subdivided. But progressive protests against these traditional divisive barriers have not been wanting. As far as the Census is concerned, agitation against caste and the enumeration of the people according to caste has gone on for some years now, at least since the Census of 1901. This anti-caste agitation started in Madras with the growth of nationalist and to a limited extent rationalist ideals and subsequently spread to Bengal, Maharashtra and the Punjab. Certain sections of the population rightly labouring under a feeling that they were victims of an invidious social system, claimed to be enumerated as Brahmins or other high caste groups, though they were differently regarded by virtue of their birth by Hindu Society. In the 1931 Census, some two million Hindus returned that they had no caste at all.<sup>1</sup> While this action demonstrating strong disapproval of societal and official attempts to list and approve of the caste system may be praiseworthy from the point of view of social reform, it was deplorable from the point of view of the Census, which seeks the facts reflecting the structure and dimensions of contemporary society.

In 1931, the impending constitutional reforms and the prospect of an extended communal franchise led to great activity on the part of religious organizations, and their anxiety to register as many adherents as possible to their religion was not concealed. This unhealthy zeal for numerical strength for particular castes, creeds and religions was visible all over India. Disputes arose in the Punjab, for instance, where the Depressed Classes, including the Harijans, claimed to be converted and classed as Adi-Dharmis, a supposedly high caste. Acute controversies arose over the question whether these Adi-Dharmis should be classed as Depressed Classes or Sikhs. It is as though Protestant, Catholic and Jewish organizations in the United Kingdom vied with one another to return as many adherents as they could of their particular faiths and thus magnify artificially through Census statistics the real strength of religious minorities in the country. Such a tendency would be dangerous not only because it suggests that numbers alone matter in a democracy but also because Census figures would then lose their scientific value.

And last, there is a certain amount of prejudice and superstition

<sup>1</sup> *Census of India, 1931* (New Delhi, Government of India Press, 1932), p. 430.

regarding Census and, for that matter, any inquisitive edict that descends upon the villagers from the governmental hierarchy in distant New Delhi. In a country where even a modicum of elementary education is a privilege, the superstition that counting the number in a household forebodes evil is bound to exist. It is true that this kind of superstition is not peculiar to India, for purificatory ceremonies after every census in Ancient Rome were performed to rid them of a supposed evil. Even in the British House of Commons, as late as 1753, the fear was expressed that 'a number of the people will be followed by some great public misfortune or epidemical distemper'.<sup>1</sup> The United States of America fared no better. In the early years of the American Census history, the fear that Census forebodes evil was manifested and, in certain parts, considerable resistance was offered.

In New York it was alleged that sickness followed a Census operation and in New Jersey it was feared that some such penalty as that imposed on David might be repeated.<sup>2</sup>

And just recently, in 1955, when a census of the Sudan was taken, the old fears of the census manifested themselves. According to a recent writer:

The first population census ever to be held in the Sudan is now being taken. The main difficulties to be contended with in taking the census are the substantial number of nomads or persons living in scattered *tukls* (grass huts); the relatively difficult communications; the large number of languages — there are over 70 different languages and, although Arabic is the *lingua franca*, it will be necessary to operate in five languages; the shortage of persons available to act as enumerators; and lastly — and most important of all — the superstition, prevalent in many parts of the country, that it is unlucky for parents to disclose all their children. To do so, it is often believed, will cause the children to fall sick or even to die . . . Of the various difficulties that the Census confronts, the most serious of all is the tendency of the head of the household to understate the number of his children. In most of the Muslim parts of the Sudan, the enumerator will not be allowed to see the children and women, and so will have to obtain all information about the household from the head of the household.<sup>3</sup>

<sup>1</sup> G. F. McCleary, *Population: Today's Question* (London, Allen & Unwin, 1938), p. 50.

<sup>2</sup> H. P. Fairchild, *People* (New York, Holt, 1939), p. 57.

<sup>3</sup> A correspondent, 'Tribes that Fear to Count Children', *The Times* (London), July 8th, 1955.



This prejudice takes at times acute and unexpected turns. On the eve of almost every census some kind of prejudice comes to the forefront. When it was proposed in 1931 to gather information about fertility, some opposed it on the ground that such a demand arose out of the desire of the authorities to vilify the Indian people. In the same way, an attempt to collect statistics about the 'educated unemployed' proved unsuccessful due to the apathy and indifference of the educated unemployed themselves, who felt convinced that counting their numbers would not redress their grievances; they were not interested in their numbers being counted for the sake of statistics and a policy that could be based on or result from such figures. The attempt to census the educated unemployed was abandoned and the Census Report observes:

The reasons given for the failure of the returns were various. In Burma (which was then part of India) the educated but unemployed are largely Indians and mostly to be found in Rangoon. The reason given for their failure to make the returns was that they feared use would be made of it to repatriate to India those who were without employment. In Bengal the reason alleged was the fear on the part of the unemployed *bhadrolak* that all that was wanted was a list of them for the police as political suspects, while another rumour accused the Government of trying to win over the unemployed from the Congress Party by false hopes of employment. In Madras the attitude of the recipient was more sensible for the recipient of the unemployed schedule was described as saying, 'You will not give me employment, why should I fill up your schedule?' and it seems likely that this feeling, together with a dislike of admitting failure to have found employment and general apathy towards the Census is to be taken as the most common cause of the schedule's failure.<sup>1</sup>

Yet one more difficulty of the Indian Census set up during the last fifty years has been the absence of an all-year-active administrative set-up and the lack of inter-censal continuity. This continuity is important, for as Walter F. Wilcox points out:

A Census Report should explain what errors may lurk in the figures, estimate, if possible, their trustworthiness and suggest such inferences as might be of more than local importance and would be accepted as trustworthy by competent students. Each

<sup>1</sup> *Census of India, 1931* (New Delhi, Government of India Press, 1932), p. 388.

successive report, like each observation of an eclipse, should confirm or correct the interpretation put on previous reports and suggest questions which only future reports can answer.<sup>1</sup>

In the past, this absence of inter-censal continuity has not been left unnoticed by the Indian Census authorities. For M. W. M. Yeatts, the Census Commissioner for 1941, pointed out that the Indian Census is a kind of comet appearing once every ten years in the statistical firmament, attracting much attention at its culmination but passing away eventually unnoticed. The Indian Census throws only one slender beam of light on a subject that should be under the watchful observation of the eye of a cine-camera.

However, to a limited extent, the absence of inter-censal continuity is in a way more apparent than real. The continuity is found at the base rather than at the apex of the Census pyramid, as contrasted with the British and American systems. A thread of continuity runs through the Indian villages which embrace the major surface area sheltering a great majority of the Indian population. And the enumeration in rural India is entrusted to the heads of the village administration — the village *munsifs* — who maintain rough registers of vital occurrences in their areas. Since they are also in charge of collecting revenue and the general administration, additions to and deductions from the village seldom escape their attention. In some parts of India these rural offices are hereditary and one may have in a village the whole of the All-India Census series represented in actual experience in the successive generations of village heads. This is nevertheless true only in theory and as the reliability of the rural records is very much in question, this kind of inter-censal continuity is only a rough approximation.

With the passing of the Indian Census Act in 1949, the Census Administration has been put on a permanent basis under the aegis of the Registrar-General and Census Commissioner, on the lines of the office of the Registrar-General in the United Kingdom and the Bureau of Census in Washington, D.C. With the present permanent organization, there is no reason why the Census operations should not be made quinquennial so as to make them as up to date and useful as possible.

This brief survey of the *modus operandi* of the Census organization reveals the difficulties faced by the administration and the extent to which they have been overcome. When all the extenuating factors, including that of cost, are taken into consideration, the Indian Census represents more or less a triumph in organization; but it has

<sup>1</sup> Walter F. Wilcox, *Studies in American Demography* (New York, Cornell University Press, 1944), p. 9.

still to go a long way before its results can achieve a readily acceptable measure of reliability.

The major defects of the Indian Census figures are many. Apart from attempts to exaggerate or underestimate (more the latter than the former) figures on the part of certain individuals and communities for political reasons (this is now becoming a thing of the past), there are certain practical difficulties which arise in recording figures about age, sex, civil condition and infirmities of the individual. These are simply the results of ignorance, illiteracy and social conditions of the masses. Legal restrictions on marriageable age tend towards efforts at concealment of marriages and this is more common among females than males. In the case of infirmities of the individual, the extent of both ignorance and wilful concealment cannot be estimated. Infirmities such as leprosy, insanity or deaf mutes in a family, cannot be easily detected by the Census enumerator at sight as the enumerator does not meet every member of the family on account of the *purdah* system prevalent in certain sections of Indian society. Even where there is no *purdah*, the head or any other member of the family who gives the information to the enumerator is not likely to give the correct information about the incidence of leprosy as it may offend the status of the family in the community.<sup>1</sup>

The defects from the point of view of the needs of our analysis of Infant Mortality are: (1) under-enumeration of the total population in the census, and this is directed more towards females than males; (2) consequent and, to a certain extent, independent inaccuracy of the sex composition of the population; and (3) defective age returns of the population which affects vitally the calculations of the number of infants under one year.

These defects can be theoretically overcome and to a certain extent they have been in India. The ideal situation is the one in which the daily official registration of births, marriages and deaths are so accurate and complete that the exact decennial census figure can be

<sup>1</sup> Such failure to report the truth occurs in some instances in reporting the causes of deaths. Instances of the failure to enter the true cause of death, even when definitely known, are not wanting. 'In countries where a copy of a death certificate, including the medical certification of cause of death, may be obtained for legal or other purposes, a physician may not always record the complete diagnosis of the cause of death if this diagnosis is likely to offend the family or the memory of the deceased. It is rather commonly believed that where this condition exists the statistics of mortality from alcoholism, syphilis, epilepsy and even cancer and tuberculosis are in varying degree understated. This is the main reason why more than half a century ago Switzerland, and later a number of other countries in Europe and in America, adopted a confidential method of reporting the cause of death which gave the health authorities information they needed and at the same time assured the preservation of professional secrecy.' *Foetal, Infant and Early Childhood Mortality* (New York, United Nations, 1954), p. 42.

foretold. And the actual census count can serve as a mere check up. But as this seldom happens in practice and as the actual situation in India is far from this ideal, sampling techniques have been pressed into use. But here, again, no matter what sampling technique is used, it can never take the place of complete vital registration and accurate census count. The sampling process, despite its numerous advantages such as economy in both time and money, is not the desirable ideal but only an unavoidable alternative.

### *Vital Statistics*

Long before Western contact, India had a complex and a quasi-religious system of registering births, marriages and deaths in the self-sufficing rural communities, though we do not know how accurate they were or what use was made of such information by the State or the community as such.

Registration of births and deaths in its modern connotation was introduced in 1844 in Madras; in 1848 in Bombay; in 1870 in Bengal; and in the decade 1870-1880 in most places that came in contact with and eventually under the central political authority. Today, after nearly seventy years, though births and deaths are recorded throughout the former provinces and in some of the large former Indian states such as Baroda, Mysore, Hyderabad and Travancore and Cochin, neither universality nor uniformity of procedure has been secured. For the Imperial Act VI of 1866 governing the registration of vital statistics does not uniformly apply to all India. The former provinces have their own legislation outlining the procedures and delegating powers to various local authorities as embodied, for instance, in the Madras Presidency Births and Deaths Registration Act XXI of 1889. Though some of the former States and some of the backward and tribal areas have been integrated into the Indian Union, they do not have, as yet, any vital registration. Judging by the actual enumeration of the population in the Census and the figures arrived at by vital statistics, only about three-fourths of the population in India is shown to be registered. In the 1931 Census it was found that out of a census population of 272 millions in the former provinces, vital registration yielded only 267 millions, or about 98 per cent. In 1941, the percentage of under-registration reached about the same proportion.

Though there is no uniform procedure in collecting vital statistics all over India and though it differs in different states, the general pattern is as follows: The village *chowkidar* or *munsif* or headman or

watchman (the agent is called all these in different parts of India) is required to pass the information — birth or death as the case may be — to some local authority like the police, who maintain regular registers. In the towns the procedure is rather easy since registration of vital statistics comes under the routine jurisdiction of the municipalities. The sanitary departments of these civic bodies take care of this as it is obligatory by law.

At regular intervals, information from these registers is tabulated and forwarded to a higher officer in charge of records of public health. These records are periodically checked by certain touring officers who belong to departments that have no connection with vital statistics. The rural information and urban reports when ready are pressed into use by the District Health Officer and the District Registrar of Births and Deaths who make up the District Public Health Report. These District Reports in their turn are forwarded to the Provincial or State Registrar of Births and Deaths and the Director of Public Health, who collect all the vital statistics and compile the Provincial or State Public Health Report. On the completion of all provincial records, the Director-General of Health Services of the Government of India compiles the all-India vital statistics and draws up the Annual Report of the Director General of Health Services for the country as a whole — the only official source material for the vital statistics of the nation. The entire procedure, as in the census organization, resembles a pyramid and the worth and reliability of the nation's vital statistics rest entirely on the validity of the information supplied by the base, the village *chowkidar* and the municipal sanitary departments.

The system is not without its drawbacks. Rural India, which accounts for a majority of the country's births and deaths, has the weakest system of registration. The rural agent — the *chowkidar* or the watchman — for recording and reporting all vital occurrences is often illiterate, ill-paid and has to attend to his permanent and more important job of being the administrative head of the village and then, as a rule, has to travel a considerable distance to make his report. When we rely on the data gathered by the *chowkidar*, we ought as well to pay due attention to the part played by 'human nature' in these statistics.<sup>1</sup>

<sup>1</sup> Sir Josiah Stamp, writing some twenty-five years ago, tells us that the individual source of the statistics may be the weakest link. Harold Cox, for instance, tells a story of his life as a young man in India. He quoted some statistics to a judge, an Englishman and a very good fellow. His friend said: 'Cox, when you are a bit older you will not quote Indian statistics with that assurance. The Government are very keen on amassing statistics — they collect them, add them, raise them to the  $n^{\text{th}}$  power, take the cube root and prepare wonderful diagrams.

Apart from the carelessness and the indifference of the *chowkidar*, the villagers themselves have not developed enough civic consciousness or statistical sense (which is rare even in advanced countries) and even otherwise are under no obligation to furnish the watchman with the necessary information. It has not, however, been proved that rural returns are less accurate than the urban returns which are under the care of the relatively more enlightened municipalities and corporations of towns and cities. This, in other words, means that urban returns are equally defective. The indifference and apathy on the part of the people, added to the insufficient and inefficient organization, result in under-registration. An effective way of obtaining social statistics in any country is by the Government's inducement of offering some worthwhile service to the citizen in return. If a child on reaching a certain age can have free educational facilities at the expense of the State, the citizen will record and obtain a birth certificate to prove to the school authorities the age of the child to obtain the free educational services offered by the State. Similarly with a rationing system. A citizen is likely to register with an official agency the number, sex and ages of his family members if he knows that his ration cards will be forthcoming only when this information is furnished to the State. Under normal circumstances, and in the absence of any tangible social service offered by the State to the citizen, the only way to remedy this is by the provision of a nation-wide rural and urban public health service, charged with the collection of vital statistics. There is a tremendous need for educating the public to report willingly, the officials to register accurately, and the departments to consolidate and analyse these vital statistics for the use of the government and the public.

The vital statistical information sought by these Government agencies in India includes particulars of births (live and still) and deaths by sex and religion. Attempts are usually made to obtain the following particulars from parents or guardians within a particular period of the vital occurrence. In case of births, the date of birth (sometimes according to the Hindu calendar, and calendars differ with different linguistic and religious groups), sex, name of the child (invariably a difficult proposition, for the children are not named immediately after birth as in the West), names of parents, age of parents and their religious affiliation (sometimes caste, though this particular is rightly being given up of late) are recorded. And the Death Registers have name, sex, date of death, religion, age and

But what you must never forget is that every one of those figures comes in the first instance from the *chowkidar* (village watchman) who just puts down what he damn pleases.' Sir Josiah Stamp, *Some Economic Factors in Modern Life* (London, 1929), p. 62.

occasionally the cause of death to the best knowledge of the informant.<sup>1</sup> These are the details, which in themselves are inadequate, as we shall presently show, of vital statistics that the law demands and the municipal and rural authorities try to enforce. As for information on other aspects such as sickness, employment, income, marital status details such as separation or divorce, nubility, fertility, legitimacy, dependency, nothing reliable or worthwhile is available for the total population.

Even in gathering information on the few items under the broad categories of births and deaths, the basic duty of recording the very births themselves, as already observed, is sometimes lost sight of. It is generally true of most countries that statistics of deaths are more reliable than statistics of births, because in the former there is always a body to dispose of, and death being generally unexpected, unwelcome and a sad event, seldom escapes the notice of the community anxious to know the cause of the event and, therefore, are more often recorded. As for births, they are natural and happy events, and nobody bothers to take notice of them in any special sense. And when it is a case of illegitimacy, the recording of the vital occurrence is understandably and intentionally avoided. This trend is exaggerated in India, for omissions in recording births are definitely greater than the omissions in recording deaths.<sup>2</sup>

This disparity is easily brought out, as pointed out already, by the gulf between the population forecast based on vital registration and the population figures reached by the actual census count. The estimated intercensal population for 1930 is given by the Census Commission as 335,873,000 while the total population on the completion of the Census count approximated to 350 millions. In the

<sup>1</sup> In India most deaths occur outside hospitals, and when they do occur in homes they are largely unattended by doctors. In fact, the death rate is so high because of the lack of rural medical facilities. Since there is no proper medical certification of death, the great majority of deaths are usually classified under three broad categories of 'fevers', 'respiratory diseases' and 'other causes'. The reporting agents or the informants cannot adequately diagnose the real pathological cause of the death. The cause is either not given, as in the case of infant mortality, or when given, as in adult cases, it is misleading. Sir Leonard Rogers found such extreme cases as reporting the case of a child who was drowned as having died of fever. One Provincial Census Report refers to the recording of childbirth as a cause of death among men!

<sup>2</sup> K. C. Ray, for instance, in his article 'A Note on Omissions in Registration of Births in the City of Calcutta', *Sankhya* (Calcutta, December 1938), points out how an estimate of intercensal registration, 1921-31, related to total population change and registered surplus of births over deaths indicates approximately 21 per cent under-registration of births. A discussion of the inaccuracies in an official report like that of the *Bengal Public Health Report 1934*, can be found in M. Jatindra Dutta's 'On the Presentation of Official Statistics' in *Sankhya* (Calcutta, December 1938).

1941 Census, the disparity was repeated.<sup>1</sup> This is due not to any faulty calculations in the population forecast as per the available methods, but to the incomplete registration of births and deaths. The want of uniformity, even in a defect, leads to various degrees of error between province and province. According to the Chief Census Commissioner, the error in vital registration for India as a whole in 1930 was about 20 per cent, ranging from half of 1 per cent in Madras to 60 per cent in Assam. The Census Commissioner points out:

In Madras province, the returns are accurate enough for the Department of Public Health to prognosticate the result of the 1931 census with an error (on the excess side) of not more than 2 per cent. Bengal and the United Provinces in that order are believed to be the next most accurate in respect of their returns.

The striking failure to register births leads to another difficult and rather embarrassing problem, that of deciding the age of an individual. Birth certificates in India are neither demanded by the people nor easily supplied by the local governments. It is true that the practice of preparing a horoscope whenever a child is born is widespread among the Hindu population. It is not known, however, how far this practice is common among the rural millions. In any case, the horoscope, being primarily intended for private consultation for marriage purposes, is seldom consulted for the benefit of the official vital statistical record or the Census enumerator, and the record of the age in consequence is merely the result of guess-work, the degree of accuracy or error depending on the intelligence of the guess and the shrewdness of the enumerator. As the vital statistical record, particularly of births, is incomplete, the age hunt of the individual during each Census count would be almost amusing, were it not so tragic.

The Census Department, therefore, has devised measures to assist friendly but ignorant citizens to discover their own age. During the Census period, each province prepares a calendar going back to about eighty years with important landmarks that linger in the memory of the public. Well-known incidents, especially those which

<sup>1</sup> A few forecasts of India's population in 1941 were made before the 1941 Census was taken. K. C. K. E. Raja, in his article 'Probable Trend of Population Growth in India', *Indian Journal of Medical Research* (Calcutta, July 1935), thought that on the basis of the proportion of the married female population of India at the reproductive ages of 15-50 to the total population, India would reach 390,238,582 in 1941. He also estimated that the population in 1941 would likely be 401,422,517, if the rate of growth in British India was applicable to the whole of India. This estimate proved incorrect by a very wide margin.



have local importance, like the great famine of 1880, the First World War of 1914-18, the influenza epidemic of 1918, the Moplah Rebellion of 1921, Mahatma Gandhi's Salt March in 1932, the Bihar Earthquake of 1934, the Quetta Earthquake of 1935, the Second World War and the Bengal Famine of 1943 — floods, fires, famines and political upheavals that have burnt deep into the memory of the individual are marked out. When an individual does not know his age, he or his folks are likely to remember some important incident of local or national importance. The earliest of such incidents that he remembers gives a clue to his probable age. Ignorance of this type can only be combated by widespread education and a provision of a nation-wide service to register vital statistics. But memory has often proved to be a misleading guide in this matter. In the case of infant mortality one would expect a parent to remember the exact age of the deceased infant as the period to be remembered is at most not more than a year. But in actual practice, obtaining the age at death of the infant has proved to be a difficult problem. For instance, the Public Health Commissioner with the Government of India, in his Annual Report for 1924, observes:

The persistent high mortality of infants may be ascribed in part to defective registration, not only of births but of infant deaths, through the inclusion of still births, since a distinction between the two is not always made by the illiterate *chowkidar* and police *mahawar* and partly to the tendency of the more illiterate of the population to underestimate the age of the deceased infants.<sup>1</sup>

If this were true, and probably it is so in certain parts of the country, the defect becomes one of over-registration as it were, instead of the supposed and sometimes proved under-registration. This contention is supported by the observation of the Director of Public Health for Central Provinces in his Annual Report for 1934. He points out that 'A study of death registers maintained in urban areas leads one to conclude that more deaths are entered under one year of age than is actually the case. Information given as to the age of the children, when reporting their deaths, is usually vague, with the result that many deaths of infants over one year are registered as under one year. This is clearly shown by the discrepancy usually met with between vaccination-birth registers which are reliable as the date of death of the child is entered against the birth entries and the general

<sup>1</sup> *Annual Report of the Public Health Commissioner with the Government of India for 1924* (New Delhi, Government of India Press, 1925), p. 26. See also 'Testing Reliability of Age Data in Census', *U.N. Population Bulletin* (New York, October 1952).

death registers. The former invariably show a much smaller number of deaths of infants under one than are recorded in the general death registers.<sup>1</sup>

It is generally supposed that this difficulty in arriving at the correct age does not prove to be of any serious import except when the age group of the population has to be decided. But there is another and a more serious aspect to this problem. The absence of any definite proof of the age of an individual nullifies attempts at social legislation. Children under a particular age, for instance, are forbidden from employment in factories and mines. Authorities have found it difficult to enforce the law against offending employers and ignorant parents for want of definite evidence of the exact age of the child worker.

This difficulty has been brought into bold relief in recent years when the Sarada Act (the Child Marriage Restraint Act) was being enforced. In many cases offending parents who were marrying off their children below the minimum permitted age could not be prevented from, or punished for, doing so due to the difficulty in proving in a judicial court that the party accused was below the age prescribed by law.<sup>2</sup> The successful working of social legislation in India, as elsewhere, depends on the availability and accuracy of vital statistics.

Nor is the registration of marriages compulsory or uniform all over India. More than 85 per cent of Indian marriages are religious ceremonies, often performed in the bride's home and occasionally in the Hindu temple. The prospective couple, with rare exceptions, do not walk into the Registrar's office and walk out after a few minutes as husband and wife, and, therefore, Hindu marriages do not get registered in any official sense. The absence of civil marriage and the want of any official status or responsibility for the Hindu priest or the temple comparable to the clergymen and the Church in Western countries leave marriages without a permanent record, or for that matter without any record at all. This does not mean that the Hindu marriage is a private and purely domestic affair. In fact, it is a public ceremony in the sense that the whole community in the vicinity more or less turns out to witness and enjoy it, this community being the only attestation to the married state of the couple. The Hindu marriage is perfectly valid and is recognized by law. The

<sup>1</sup> *Annual Report of the Public Health Commissioner with the Government of India for 1934* (New Delhi, Government of India Press, 1935), p. 62.

<sup>2</sup> The Sarada Act, providing penalties for marriage of girls under 14 and of males under 18 which came into effect in April 1930, and corresponding legislation in certain Indian States like Baroda, Kashmir and Mysore, led to a definite decrease in the accuracy of the records of age and civil condition.

registration of marriages in the Western countries is primarily to provide a permanent record of the civil condition of the citizen for legal and quasi-legal purposes like legitimacy, succession, inheritance, separation, divorce, etc. As social legislation in India has not developed either in value or volume, these considerations have not gained importance. But they are bound to, as the cultural fabric becomes more complex and when it is realized that social legislation cannot be enforced without adequate statistical data on the demography of the people.

Apart from serving legal purposes in proving legitimacy of birth, succession and inheritance of property and division of the estate of the deceased, an equal need for accurate vital statistics is felt in formulating public health programmes. Unless it is known at what age men and women marry, their fertility, health and ailments, their deaths and their causes, no government can intelligently formulate an effective public health policy. The Public Health Department is severely handicapped for want of accurate records in their efforts to apply preventive methods, because they do not know what diseases account for the high rate of mortality which they are trying to control.

Fortunately, these defects and lacunae in the collection and compilation of the Indian vital statistical data have not gone unnoticed over the last half a century. Every commission and committee that has inquired into some aspect of Indian economy has emphasized the undesirable nature of the sectional, incomplete and inaccurate data and has forcibly pleaded for a reorganization of the system of vital registration. The lament over the inaccuracy, incompleteness and unreliability of vital statistics began from more or less the beginning of the century.

At the Third All-India Sanitary Conference held at Lucknow in 1914, the British delegate representing the Government of India spoke at length pleading for more accurate vital registration. He concluded:

In India the only certain thing we know about vital statistics at present is that they are highly inaccurate. They are more inaccurate in some areas than in others. We do not know the extent of their inaccuracy. We can only guess.<sup>1</sup>

The Royal Commission on Industries in India did not have much to do with population, vital or morbidity statistics, but they found it necessary while discussing Indian statistics in general to observe:

<sup>1</sup> *The Proceedings of the Third All-India Sanitary Conference held at Lucknow, 1914* (Calcutta, Thacker Spink, 1914), p. 62.

There is very little statistical data that can be relied on regarding the incidence of occupational disease or of the effects of industrial occupation on the prevalence of the common forms of communicable disease. This is a matter that urgently calls for thorough investigation. . . . In spite of the admitted paucity of reliable statistical data it may be profitable to offer a few remarks as to the effects of these diseases on the efficiency of labour.<sup>1</sup>

Discussing the incidence and effects of tuberculosis on Indian labour, they referred again to the want of statistics:

As regards tuberculosis and its special prevalence in workshop and factory, we have very few statistical records to guide us. There is evidence, however, that the disease is more prevalent in the large industrial centres than elsewhere; that the disease is definitely on the increase in rural areas abutting on such centres from which labour is drawn and to which the victims of the disease go to die; and that sufficient precautions are taken in few factories to reduce the risk of such places affording facilities for the transmission of tuberculosis infection from the sick to the healthy.<sup>2</sup>

In 1928 one more commission, the Royal Commission on Agriculture in India, in their Report, drew attention to the paucity and the unreliable nature of the available vital statistics. They said:

Under the heading 'vital statistics' are comprised the returns of births, and deaths, occurring annually among the community, the causes of death, the nature and the incidence of the diseases from which the community suffers, the numbers and descriptions of institutions available for the treatment of the disease, the extent of the preventive measures taken against small-pox and cholera, and the strength and distribution of the health and medical services. The statistics of disease and of the causes of death are liable to inaccuracies which are due, in the main, to the same influences which affect the accuracy of agricultural statistics. We are confident that the public health officers are alive to the need for improvement and the only suggestion we have to make is that the statistics under the various heads should always be shown separately for rural and urban areas. At present, this separation is only effected in the case of deaths. We

<sup>1</sup> *Report: Indian Industrial Commission, 1916-18* (Calcutta, Government Printing, 1918), p. 460.

<sup>2</sup> *Ibid.*, p. 462.

think also that the number and distribution of institutions for treatment of disease and the strength and distribution of the medical and health services should be shown separately for urban and rural districts. We consider it very important that the extent to which rural areas still lack these essential services, and the progress which is made in supplying them, should be stated clearly in the returns. There is also much useful work to be done in correlating the data of the incidence of disease and the death rate in rural areas with those relating to the agricultural conditions which prevail in those areas and with changes in those conditions arising from such causes as the extension of irrigation, improvements in the drainage of deltaic tracts, and the like. Similarly, the correlation of the statistical data relating to health conditions with changes in diet and with the conditions under which the staple foods consumed in the tract under consideration are grown, whether, for example, they come from irrigated or 'dry' land, should in time yield information of the greatest value.<sup>1</sup>

In 1929, the Age of Consent Committee reported, recommending to the Government that the age of consent within marital relations be raised to fifteen years. While examining this question they could hardly ignore the unreliable aspect of Indian vital statistics, on whose accuracy and dependability any statutory age of consent could work. The Committee reported at length on what has become by now a periodical lament and it is worth quoting in full:

Registration of births and deaths: the Law of Marriage and the amendment of the Law of Consent, which we have recommended, depend on their successful working to a large extent on the facilities which may exist for the accurate determination of the age of the party concerned. During our inquiry we have given great prominence to the consideration of the question, whether there is an accurate method of recording births and deaths and what defects there exist at present in connection with such records. We have been impressed by the fact that these records are neither as accurate nor as complete as may be desired. In rural areas, in practically all the Provinces, the record of births is admittedly deficient. Even in urban areas, though the improvement is noticeable, it is still far short of what is requisite.

Officers of the Department of Public Health in all the Pro-

<sup>1</sup> *Report of the Royal Commission on Agriculture in India* (London, H.M.S.O., 1928), p. 614.

vinces have deplored this fact and have suggested various means to remedy the defect. Census operators and witnesses before us have repeatedly drawn attention to this fact. We are aware that within the last decade an advance has been made, particularly in some provinces where a fairly adequate health staff has been paying special attention to this problem.

We feel, however, that the time has come when steps may be taken to ensure a more accurate registration of births and deaths. In the different Provinces under local Acts various authorities have been entrusted with this duty. The Imperial Act which governs the subject is the Act VI of 1886. It seems to us that a greater uniformity of laws in the Provinces together with more rigidity in their enforcement is called for. It has been suggested that in addition to other persons who may be under an obligation to report the birth or death of a child, parents and guardians of the infant should invariably be under an obligation to report such cases within seven days from the date of the birth of the child. It has been further suggested that every Municipal Council, Taluk Board, District Board, Union Board, Village Panchayat or Notified Area should be under a statutory obligation to maintain an accurate register of births and deaths and required to take stringent steps to enforce registration and prosecute those who fail to do so. This power is now conferred on these bodies in some Provinces only.

One great defect in the registration of births is the fact that the name of the child is not given. The identification of the child from the birth register becomes very difficult where there are several children born at comparatively short intervals and the date of birth of one child can, either wilfully or through mistake, be confused with that of the preceding or succeeding child. The suggestion has been made therefore that the order of birth of the child may be given. Even this, though helpful generally, will often fail in its purpose, especially where some of the issues die.

A further suggestion of a more helpful character is that the name of the child should be entered. The fact that the name of the child is not given till some weeks or even months after the birth of the child makes this impossible at present. A supplementary report within a specified period will therefore be necessary when the name of the child, if surviving, will be entered in the register. We find that in some municipalities the name of the child is given at the time of vaccination and with the help of the vaccination register the birth register is later amplified by the entry of the child's name. We recommend that in all urban and rural areas the father or other guardian of every child born shall,

where not already required by law, report the birth of the child in such form as may be prescribed within a stated time to a prescribed local authority and make a further report mentioning the name given to the child, if surviving, within a year of the birth, to the same authority. We further recommend that the prescribed authority be required to maintain a register of births within a given area under its control, and to take stringent steps to enforce registration and to prosecute persons who omit to send a report within the prescribed period.

It is essential that these birth and marriage registers should be permanently preserved and that they should not be destroyed after a short period. The proof of age being mainly dependent on these registers, their retention is essential. It is also desirable that certificates of birth should be issued to the parent or guardian when the name of the child is reported and that the members of the public should be in a position to secure copies of such certificates on payment of a prescribed fee. We recommend that the registers of births be permanently preserved and that birth certificates, giving the date of birth, sex, parentage and name of the child and such other particulars as may be prescribed, be issued free by the prescribed authority, to the person making the report when the name of the child, if alive, is reported to the said authority.

**Registration of marriage:** It has been urged by several witnesses that registration of marriages is essential to make the Laws of Marriage and Consent effective. At present, there is no provision for the registration of marriages generally. However, among Brahmos, marriages are registered under Act III of 1872. So is the case among Parsis by Act XV of 1865 and Indian Christians by Act XV of 1872. Among Muslims, marriages are in some places optionally registered by *Kazis* and in Bihar and Bengal by persons appointed by the Government for the purpose, and the *Kazis* register is generally used to corroborate the fact of marriage and to establish the terms of dower; but the registration of marriages is not declared obligatory by law. It has been suggested that the registration of marriages be made compulsory in all cases in the same manner as under several local enactments, births and deaths are required to be reported to the prescribed authorities. The registration will only be a record of the fact of marriage and will in no way affect the validity of the marriage. It will be extremely difficult to enforce the Law of Marriage unless the reporting of a marriage to a specified authority is made obligatory. The Law must require that every marriage should be duly reported by some person or persons made

responsible by law to report, the report to be verified in such a manner as may be prescribed within a specified time to an authority specified by the local Government. In the case of *Purdanashin* women, the report may be sent through an authorized agent. The report should contain the name, parentage, description, address, age, date and place of birth of the parties to a marriage. Such report can be sent by post and need not be personally presented to the authority concerned.

In addition to this, it has also been suggested that the Village *Munsif*, *Patel*, *Lambardar* or *Chowkidar* of every village where a marriage is celebrated shall be under a similar obligation to submit a report, to the authority concerned, of such marriage giving such particulars as may be ascertainable within a prescribed time. The object of these reports is to enable the officer concerned to register the marriages and to find if the law has in any way been violated. Where either on information received or on a comparison of the reports, the registrar has reason to believe that an offence has been committed, he may hold a preliminary inquiry and if satisfied, report the case to the nearest magistrate competent to try the case. The suggestion has further been made that the obligation to report such cases may be laid on the registering officer by law where he is satisfied that an offence has been committed.

The question what agency should undertake the work of registering marriages has been discussed by several witnesses. We have not, however, the material before us to make specific recommendations on the subject. It is possible that it may vary in different Provinces and that some existing department of a local Government may be empowered to discharge this duty. The number of marriages celebrated annually is so large and the work involved so heavy, that we do not think it will be useful to suggest any cut and dried scheme for the purpose. There will be the Provincial head, perhaps the Registrar of births, deaths and marriages appointed by each local Government under Act VI of 1886. Under him there will be District and Taluk officers who will be authorized to register such marriages. In some provinces at least the registration department suggests itself as the most suitable for the purpose. But as already stated, the question of agency and such questions as the person who should be authorized to initiate prosecutions, whether a Sub-Registrar or a District Registrar, must be left to a more detailed examination by the Government and the Committee must content itself with putting forward the various suggestions made in this connection.



It may be pointed out that the Baroda Marriage Act makes the registration of marriages compulsory and that the extent to which prosecutions of breaches by the law have been successful in that State is due almost entirely to such registration. It is also obvious that the registration of marriages will be of substantial assistance both in preventing early marriages and providing a permanent record.

Where the age of marriage is publicly declared, the parties will naturally be careful not to consummate the marriage before the statutory age. Moreover, an inspection of the marriage register will considerably strengthen the hands of those individuals or associations which suspect that an offence has been committed and which would welcome an indisputable proof of age before instituting a prosecution. We recommend that an accurate marriage register in a prescribed form be kept through an administrative department of Government containing details of marriages including the ages of the couples, that it be made obligatory by law on parties and guardians of parties to the marriage, either personally or through authorized agents, to report the same to a prescribed local authority.

That the officer keeping the register of marriages be empowered and also be charged with the duty to complain of any breach of the marriage law, or any omission to report a marriage or of a false entry in the details required in the registration of marriages, to the nearest magistrate having jurisdiction to try such cases, after such preliminary inquiry as he thinks fit to make.

We also recommend that the registers of marriage be permanently retained, and that certificates of marriage be issued to the parties concerned free of cost, when the marriage is reported.<sup>1</sup>

In 1930, the Royal Commission on Labour in India was confronted with the same problem again. They examined at some length the value of Indian vital statistics and the nature of the population problem in India:

Although more than one attempt was made to give us vital statistics for groups of individual workers, none of these gave a picture sufficiently accurate to demonstrate any relation between industrial activity and increased death rates. This is not a matter for surprise when it is remembered that even in the larger towns, few sick persons see a doctor and certification of death is usually a matter of guess-work on the part of a non-medical registrar. Moreover, deaths are registered under one or other of only six

<sup>1</sup> *Report of the Age of Consent Committee, 1928-29* (Calcutta, Government of India Press, 1929), pp. 145-9.

or seven heads, three of these being smallpox, cholera, plague, so that by far the largest number is entered under all other causes. Lack of appreciation of their value in public health and of training on the part of individuals responsible for their collection lead to the continuance of grave inaccuracies in such records. Again, in industrial areas the influx of large numbers of young males changes the age-distribution to a marked extent, and the failure to apply the necessary correction factor, before comparing them with other areas where the population is distributed more normally over the different age and sex periods makes fair comparison very difficult. There is therefore little chance of obtaining reliable statistics for special groups such as industrial workers and, in consequence, we have been unable to make any estimate of the effect of industrial life, as distinct from urbanization, on the death rates of these communities. Curious variations prevail in the methods of registering throughout the different provinces. We recommend that still-births should be excluded from both birth and death registers and that they should be separately recorded. Only when this is done will it be possible to obtain the useful information which these figures should provide.<sup>1</sup>

Turning to morbidity statistics, the Commission pointed out:

We met with even greater difficulties in connection with the incidence of sickness among industrial workers. Few employers know the rate of sickness among their workers, and little is known of the amount of sickness in the general population. The records of hospital outpatient departments and of dispensaries refer to the general population living in their vicinity. Even where a particular industrial concern maintains its own medical staff and dispensary, the Indian worker frequently absents himself from work without reporting to the factory doctor. In a number of industrial concerns, it is necessary to keep an additional 10 per cent of workers on the wage books as substitutes to fill the places of absentees but neither this figure nor the figures of absenteeism can be used as a basis for estimating sickness rates, since the Indian worker stays away from his work for many reasons besides sickness.

Inferences from available figures: Erroneous though they are, the registered statistics show that birth rates generally are extraordinarily high as compared with those prevailing in

<sup>1</sup> *Report of the Royal Commission on Labour in India* (Calcutta, Government of India Press, 1931), pp. 249-50.

Western countries, and both general and infantile mortality rates are correspondingly high. The general death rate in India, on a conservative estimate, may be taken to be between 30 and 35 per 1000. It is known that the average expectation of life at birth is only about 25 years as compared with over 54 years in Great Britain. These two figures, although approximate, make it certain that sickness rates for the general population are several times higher than the corresponding rates for Britain. This brings us no nearer an estimate of the actual rates among industrial workers but it is certain that sickness and disease exact a heavy toll and detract from their efficiency and earning capacity to a marked extent.

The necessity for improved vital statistics is generally recognized and in several provinces marked improvements have been effected within recent years by stricter supervision and more effective inspection. It is essential, however, that municipal councils and local bodies, who are primarily responsible for registration, should devote much more attention to the matter. In the larger towns and the more important industrial areas, at least the appointment of medical registrars should be compulsory since only then will it be possible to improve the classification of causes of death.<sup>1</sup>

In 1933, the Government of India invited two British economists, Professor A. L. Bowley and Mr. D. H. Robertson, to advise them on the question of obtaining more accurate and detailed general statistics than were then available in India. In 1934 they submitted a Report on a scheme for an Economic Census of India. While population census and vital statistics were beyond the purview of the terms of reference, they found it difficult to ignore the role of population statistics in any plan for the economic development of India. They wrote:

The vital statistics of India are well known to be defective (*Census of India*, 1931, Vol. I, Part I, p. 91). This is evident both by knowledge of the methods of recording births and deaths, and by comparison in total or detail with the population censuses. Thus, in the decade 1921-30 about 83,500,000 births and 63,500,000 deaths were recorded in British India, while the increase between 1921 and 1931 was according to the Censuses 24,700,000 instead of 20,000,000 (the defect is more than 4.7 millions in 83.5 millions because deaths as well as births are unrecorded); while there is probably a deficiency in the record of

<sup>1</sup> *Report of the Royal Commission on Labour in India* (Calcutta, Government 1931) pp. 249-50

deaths, it is evident that the error in the record of births is more considerable.

The only excuse for estimating birth and death rates at all on these figures lies in the hope that the error is constant and therefore the tendency towards higher or lower birth or death rates can be known. But since any improvement in the organization results in apparently higher rates, the evidence would only be valuable if a decrease was shown, whereas in 1921-30 there is no clear tendency in either direction. . . . It should be seriously considered whether these figures should be published at all, except for areas where there was reason to believe substantial accuracy is obtained since they lead to quite unjustifiable conclusions. They have their use, however, to medical officers of health if these are aware of their limitations. If published, at least allowance should be made in the denominator for the growth of population.

Meanwhile, it is possible to make a fairly good, if hypothetical, estimate of the growth of population by the use of the Life Tables given in the Actuarial Report of the Census. These tables do not depend on the records of deaths but on the study of the figures of the Censuses of 1921 and 1931. Their accuracy is reduced by the aberrations that are known to be present in the statement of ages, but the mathematician is able to smooth these away with reasonable accuracy. By applying the Life Table to the (amended) numbers in the 1931 Census it can be estimated how many at each age will survive for 1, 2 . . . 10 or more years. Thus the population aged 10 years or more in 1941 can be forecast, apart from migration, on the hypothesis that the rate of survival in 1921 to 1931 is repeated in the following decade. This assumes that the average death rate, age by age, is the same in the second as in the first decade, and great aberrations from this will be evident even in the imperfect records of deaths.<sup>1</sup>

In 1945 the Government of India appointed a Commission to inquire into the Bengal Famine of 1943 which resulted in an estimated loss of more than a million and a half lives. This Commission also could not avoid passing strictures on the value and validity of Indian vital and health statistics. They reported:

All public health statistics in India are inaccurate. Mortality figures indicate trends in the death rate but can rarely be accepted as absolute. Even in normal times, deaths are not fully recorded

<sup>1</sup> A. L. Bowley and D. H. Robertson *A Scheme for an Economic Census of*

and the number of births registered may be 20 to 25 per cent below the number of births that have actually occurred. The famine mortality statistics issued by the Bengal Public Health Department, it may be remarked, tell a sufficiently tragic story, as they stand. Many people have, however, maintained that they grossly underestimate the actual number of deaths. Thus, witnesses appearing before the members of the Commission in Dacca estimated deaths in the districts in 1943 as one million, whereas the figure recorded by the Public Health Department was 149,000. . . . While the Commission cannot accept popular views on mortality, it is nevertheless of the opinion that the official figures underestimate the total number of deaths.

In rural Bengal, as elsewhere in India, the primary collector of mortality statistics is a village functionary to whom deaths are reported by relations of the deceased in the village. The village *chowkidar* reported deaths to the Union Board Office, where by several stages the records ultimately reached the office of the Director of Public Health. The *chowkidar* also reports the cause of death. In normal times the system scarcely lends itself to scientific accuracy and in 1942 and 1943 other factors making for errors and omissions were introduced. In certain places the salaries of *chowkidars* were not paid and they deserted their posts to obtain work on military projects and aerodromes. During the famine, *chowkidars* were not immune from starvation and disease and some of them died. The replacement of dead and vanished *chowkidars* was no easy matter and several weeks or months might have elapsed before successors could be found, during which deaths presumably went unrecorded. Further in the height of the famine thousands of people left their homes and wandered across the countryside in search of food. Many died by the roadside — witness the skulls and bones which were to be seen there in the months following the famine. Deaths occurring in such circumstances would certainly not be recorded in the statistics of the Director of Public Health.<sup>1</sup>

In the same year, 1945, the Population Data Enquiry was appointed. They went into the question of the organization of the Census and vital registration. Commenting on the nature of the available Indian vital statistics, they pointed out:

There is knowledge about them. It is well known that the birth rates and death rates run much higher than in countries of the

<sup>1</sup> *Famine Enquiry Commission: Report on Bengal* (New Delhi, Government of India Press, 1945), pp. 108-9.

West. And that infantile and maternal mortality rates are very much higher. But there is a great difference between declaring that piece of undoubted knowledge and stating the actual rates themselves. There is then no real contradiction between the fact that the birth and death rates in India run consistently higher and the inability to say with confidence that they are precisely this and not that particular figure. Policies and departures in policy should, however, always refer to accurately recorded facts and now that population questions in India are receiving so much attention the time has come (is in fact long overdue) for the actual organization of the information itself to receive attention.<sup>1</sup>

They went on to discuss the role of the apparently unavoidable *chowkidar* and the extent of under-registration. They reiterated what has become common knowledge:

Indian vital statistics are still collected in many cases at second- or even third-hand and may have no stronger basis than the recollections of an illiterate *chowkidar*. . . . To be absolutely satisfactory, vital statistics should be (a) 100 per cent complete and, (b) 100 per cent accurate. This being a world of imperfection neither of these will in practice be achieved but it is definitely within the power of any Government to establish 98 or 99 per cent completeness, and although not so easily, a substantial uniformity and elevation of standards which will enable the information to be used with confidence in projection. . . . A close study of one of the better areas of registration shows that the lowest figure of underestimation of births is 40 per cent and that a more likely one is over 50 per cent. For underestimation of deaths the range is even greater, from 35 to 55, with probabilities again nearer fifty, nearer the top than the bottom. If the ages are taken into question the under-enumeration of deaths covers a span of 25 to 65 per cent.

The Government of India should take positive steps to bring about ultimately complete, regular and accurate vital statistics in India. The record should invariably show in the case of births, the age of the mother and the number of births and for all births and deaths should invariably show the community and means of livelihood of the parents of the child or of the deceased person.

It is essential that the Central Government enter the vital statistics field by prescription of standards, establishing a right

<sup>1</sup> *Report of the Population Data Committee* (Simla, Government of India Press, 1945), p. 3.

of inspection of the provinces' and states' figures, and by financial or other assistance as indicated. There should be an officer or an organization at the Centre definitely charged with the co-ordination of all information on population growth, covering, that is, not only the Census but the vital statistics and all allied matters. . . .<sup>1</sup>

But no steps were taken about these recommendations and nothing emerged from the labours of this committee.

In 1946 the Government of India appointed yet another committee, this time to survey the country's health and allied problems, under the chairmanship of Sir Joseph Bhore. This Committee pointedly referred to the now familiar story of under-registration and the unreliability of the general health and medical statistics in the country. The formulation of a national public health policy presumes certain desired objectives and efforts to reach them; and such an effort can be possible only on the basis of a large body of reliable knowledge of births, sickness and deaths in the country. The Government which is anxious to lower the death rate must know what conditions and diseases are responsible for the high death rate which they are seeking to reduce. A policy must be built on facts and as long as there is uncertainty as to these there must be some inevitable confusion and conflict regarding the aim. The Committee examined the nature and methods of registration of vital statistics and their defects. They observed:

The term vital statistics can in its wider sense include information relating to a wide range of human activities, but it is usually applied to a narrower field covering births, deaths, marriages and the incidence of disease in the community. In India registration of marriage does not take place among the two communities, the Hindus and Mohammadans, who together form over 90 per cent of the total population. Such statistics as may exist in this country for marriages can therefore relate only to a small section of the population and we shall not therefore refer to them here. We shall confine ourselves to the statistics of births, deaths and morbidity. As regards the last, no country can claim reasonably accurate statistics for the population as a whole, except in the cases of certain diseases which are made notifiable by law. In India, the available statistics in respect of births, deaths and notifiable diseases are defective. Such defects are associated partly with the registration of these vital events and partly with their compilation. Before

<sup>1</sup> *Report of the Population Data Committee* (Simla, Government of India Press, 1945), p. 20.

we deal with these defects it may be of advantage to describe briefly the agencies employed in different parts of the country for the registration and compilation of vital statistics.

**Agencies for Registration and Methods of Compilation:** In towns and cities the municipal authority is responsible for the registration of vital statistics and this function is usually a part of the duties of the health department. In the rural areas the village watchman or the *chowkidar* is usually the reporting agent. In Northern India generally, the registrar is the officer in charge of the *thana*, or police station, while in the province of Madras the village headman is the registrar. In those provinces in which the registrar is the police station officer, births and deaths are registered on specific days of each month, when the *chowkidar* is required to report himself at the police station. The interval between such visits of the *chowkidar* is in some areas a week and in others a fortnight. In areas where the village headman is the registrar the recording of these events takes place more promptly.

As regards infectious diseases, it is understood that in certain provinces, an outbreak of any of the common infectious diseases has to be reported by the village *chowkidar* immediately to the police station concerned, although subsequent events are brought to notice only on the days on which he is required to visit the *thana* headquarters in connection with his routine duties. In the province of Madras, daily reports are required to be sent, it is understood, by the village headman throughout the course of an epidemic.

The procedure in regard to the compilation of vital statistics differs to some extent in the provinces. In Bengal, for instance, the figures for the different rural *thanas* in a sub-division are compiled in the office of the sub-divisional officer and then passed on to the District Health Officer who, after including those for municipalities, which he receives direct, submits the figures to the Director of Public Health. In those provinces in which a public health organization has not been built up in the districts, the civil surgeon is responsible for the compilation of the statistics for the district as a whole and for their submission to the Director of Public Health. The province of Bombay, which belongs to this category, is an exception. Here returns from municipalities and *talukas* are submitted to the Assistant Director of Public Health of the range concerned and he sends a consolidated return for his range to the Director of Public Health. In the Province of Madras the compilation of all the returns from individual villages has been centralized in the office of the Director of Public Health, the return from each



village passing through the *Tahsildar* of the Taluk, to the Director of Public Health. It has been the experience that the chances of error in compilation become greater when the number of intermediate stages of compilation is increased.

**Defects in Registration:** These are mainly: (1) omission to register appreciable numbers of births, deaths and cases of notifiable diseases and, (2) incorrectness of the recorded cause of death.

**Incompleteness of registration:** Some idea of the extent of error, for the country as a whole, through incompleteness of registration, may be obtained from a comparison of the recorded birth and death rates for British India and those derived by what is known as the 'Reverse Survival' method.

TABLE NO 1. *Recorded and Estimated Birth and Death Rates in India (Provinces)*

Period	Birth Rate		Death Rate	
	Recorded Rate	Estimated Rate (reverse survival method)	Recorded Rate	Estimated Rate (reverse survival method)
1891-1901	33	46	31	44
1901-11	37	49	33	43
1911-21	37	48	34	47
1921-31	33	46	25	36
1931-41	34	45	23	31
1941-51	28	40	20	27

The differences between the birth and death rates based on the registered figures and those obtained by the reverse survival method are appreciable in respect of every decade.

One of the causes for such incompleteness of registration is that, over large areas in the country, registration of births and deaths is not compulsory. Further, even in those limited areas where registration is compulsory, the provisions of the Acts are rarely enforced so that generally speaking vital statistics are deplorably defective. Another cause is that the village *chowkidar* who is responsible for reporting these events in respect of the rural population, and the police, who are responsible for registration, are so overburdened with other work that the tendency is to regard their duties in connection with vital statistics as of relatively smaller importance.

**Incorrectness of the Registered cause of Death:** A reasonable degree of accuracy in the registered cause of death can be

obtained only by certification by a medical man who has had the opportunity of examining the patient before his death. The absence of an adequate health service to meet the requirements of the people and the fact that, for the rural areas as a whole, the reporting agent is the illiterate *chowkidar* together help to render the recorded census of mortality of little value from the point of view of assessing public health conditions. No accurate estimate of the degree of error in these recorded causes of death can be given. The results of a scheme of verification of the cause of death in Delhi City carried out by the Medical Officer of Health during 1937 may, however, help to throw some light on this question. Of 9660 deaths registered during the year, nearly 98 per cent were inquired into by medical men and, from the history obtained, the probable causes of death were deduced. Obviously such a method is defective as compared with medical certification. Nevertheless, the 'verified' cause of death is likely to give a greater measure of accuracy than the cause ordinarily registered. The following figures and the comments on them are quoted from the 1937 Annual Report of the Public Health Commissioner of the Government of India:

TABLE NO 2. *Notified and Verified Causes of Death in Delhi City, 1937*

	Notified and registered cause of death	Verified cause of death
1. Malarial fever	5	236
2. Measles	123	123
3. Typhoid fever	395	388
4. Diabetes	10	13
5. Smallpox	575	575
6. Broncho-pneumonia	6	2252
7. Pneumonia	1035	568
8. Phthisis	516	882
9. Puerperal fever	1	50
10. Senile debility	29	661
11. Infantile diarrhoea	123	1171
12. Premature birth	5	194

In some cases the discrepancies are very large. The combined figures for pneumonias, for instance, show a difference of 1779; infantile diarrhoea, premature births, phthisis and puerperal fever all show considerable variations, while for 'senile debility', the number recorded is no less than 632 in excess of the registered

number. If the assumption is made that the 'verified' causes of death give a greater measure of accuracy than the 'notified' and 'registered' causes, then the striking differences in numbers under such headings as pneumonia, puerperal fever, infantile diarrhoea and 'premature birth' signify certain directions along which preventive measures should be taken. In the absence of medical certification, even verification of the cause of death on the lines indicated above can be of great value from the point of view of health administration.

**Errors of compilation:** In the Madras province, when the compilation of all returns from individual villages was centralized in the Office of the Director of Public Health, a considerable improvement was recorded. Defaulters could be watched and appropriate action taken so as to ensure that the consolidated return for the Province was made as complete as possible. We have already pointed out that the general experience has been that, with an increase in the intermediate stages of compilation, the chances of error creeping in become greater. In recognition of this, the Central Advisory Board recommended that other provinces should also adopt the centralized form of compilation which has been in operation in Madras.

**Notifiable diseases:** The large omissions in the registration of births and deaths and errors in compilation apply also to notifiable diseases. The extent of error in regard to omission is, however, less in the case of the common epidemic diseases of cholera, smallpox, plague, than in respect of other infectious diseases. This is due to the fact that the signs and symptoms of the former are generally known to the people. Although it will not be correct to claim even a reasonable approach to completeness of registration for these three diseases, the recorded figures for them give a fairly clear indication of their varying incidence from year to year. Such an assumption is not permissible in respect of other communicable diseases. Indeed, many of them can be diagnosed only if medical aid and laboratory facilities are available. Examples are tuberculosis, cerebrospinal fever, typhus, typhoid and relapsing fever. These are now notifiable in both rural and urban areas in a certain number of provinces. In the absence of the necessary facilities for proper diagnosis it seems certain that no reasonable proportion of the actual occurrences of these diseases will be brought on record, while the correctness of the registered events under each disease is open to question. The number of communicable diseases which are notifiable in the different provinces varies considerably. For instance, the 1937 Annual Report of the Public Health Com-

missioner gives 22 per cent for the Central Provinces and 20 per cent for the Punjab. The question of reducing the list of diseases notifiable in rural areas to the minimum possible and of increasing the number of such diseases in urban centres in proportion to the facilities for diagnosis which may be expected to be available will have to be considered when we put forward our proposals for the improvement of vital statistics.

To sum up, the main defects of the existing system of registration and compilation of vital statistics in India are:

1. registration is not compulsory over large parts of the country;

2. even when registration is compulsory, failure to enforce the law against defaulters has resulted in no material improvement being effected in such areas;

3. omission to register births, deaths and cases of notifiable diseases is appreciable in all parts of the country, a contributory factor being that the duties to be performed by village *chowkidars* and police officials in regard to vital statistics are not adequately discharged because of other important duties they have to attend to;

4. gross inaccuracy in the registered causes of mortality in the absence of medical certification of death;

5. large omissions in the recorded incidence of notifiable diseases and incorrectness in their diagnosis, mainly owing to the fact that many such diseases have been made notifiable in areas where no proper facilities for their diagnosis exist; and

6. errors in compilation, probably assisted by the fact that, in certain provinces, this work is carried out at a number of administrative levels.<sup>1</sup>

In the light of this survey, the Committee recommended the creation of the Registrar-General and several provincial and district offices charged with the task of the collection and compilation of vital and population statistics. While pleading for more compulsory registration, they pointed out:

Efforts to improve the administrative machinery and thus produce an increase in vigilance on the part of the Governmental staff to secure better registration cannot eventually produce the same results as an awakening of the sense of responsibility of the people to themselves and to the state for recording the vital events that take place in their homes. While the efforts of the

<sup>1</sup> *Report of the Health Survey and Development Committee*. Vol. I. Survey (New Delhi, Government of India Press, 1946), pp. 153-7.

health staff through educative work will, no doubt, contribute to this awakening, an effective method of stimulating interest will be by creating conditions requiring, in an increasing degree, the production of proof of age, community, parentage, etc. If courts, schools and other institutions could be induced to insist on the production of birth and death certificates, the public will begin to feel the necessity for registering births and deaths in their own interest.

There is little doubt that the more general introduction of compulsory registration would have considerable effect in the direction of improving vital statistics. Moreover, even in those areas in which little or no notice is taken of breaches of the law, a few judiciously selected prosecutions would have a salutary educational effect. We consider that the enforcement of the law through the prosecution of offenders is essential if definite improvement is to be secured.<sup>1</sup>

In the same year (1946), the Interdepartmental Committee on Official Statistics of the Government of India submitted its Report for the Central Co-ordination of all official statistics. Commenting on the nature of public health and vital statistics, this Committee pointed out:

There is sufficient information for British India in regard to the number of hospitals and dispensaries and patients treated. Figures of births and deaths are also regularly published but the present system of collection of basic data should be overhauled so that the time lag may be reduced and the quality of the material may be improved. *The Births, Deaths and Marriage Registration Act of 1886* under which the figures are collected at present provides for only a *voluntary* registration of births and deaths. It should also be remembered that marriage is not necessarily registrable in the case of the two principal communities (Hindus and Muslims).

The position, however, is not unsatisfactory in the urban areas where special bylaws have been passed by municipalities for the purpose of recording births and deaths. In regard to the rural areas, there exists in no province, with the exception of Madras, any machinery through which the Provincial Health Authority can be readily acquainted with conditions in the districts. It seems to us that the first essential step would be to frame an All-India Act containing provisions of a mandatory nature. If the Provincial Governments can be convinced of the

<sup>1</sup> *Report of the Health Survey and Development Committee*. Vol. II. *Recommendations* (New Delhi, Government of India Press, 1946), pp. 278-80.

importance of such central legislation it will be possible to proceed (as envisaged under Section 103 of the Government of India Act, 1935) to regulate the registration of vital statistics throughout British India on a uniform basis.

The Central Government can also prescribe the qualification of Registrars, the period within which registration should be carried out, and the penalty for non-compliance. It is possible that special circumstances such as lack of adequate laboratory facilities may make it useless to notify particular diseases in certain areas. We would then suggest that although the Act should provide a uniform set of notifiable diseases for all Provinces, the decision regarding the enforcement of the provisions in respect of a specified disease in any area should be left to the discretion of the Provincial Government. It is to be hoped that with the gradual expansion of health services, the areas over which individual diseases can be made notifiable will extend greatly and the degree of reliability of the registered figure will increase proportionately.

It is a fact that in rural areas public co-operation is not too readily forthcoming but if, for instance, the production of a birth certificate were made compulsory for admission to a primary school or for holding any appointment under an established authority, the position will, without doubt, improve greatly.

It has also to be considered how best the collection of vital statistics in Indian States can be arranged on lines similar to those obtaining in British India.<sup>1</sup>

In 1949, two Indian statisticians reported on the statistical organization existing then in the provinces and the states. In their review of the vital statistical organization, they travel over what is now an old and familiar story. Though their observations are neither original nor novel they are reproduced here to complete the record of official and quasi-official evaluation of the nature and accuracy of the Indian population and vital statistical record. They write:

*Inaccuracy:* The main feature about vital statistics in India is that figures of births and deaths are not reliable. The margin of error may be about 20 to 30 per cent or more in the case of births and perhaps somewhat less in the case of deaths, the error usually being on the side of underestimation. Objective evidence about defects in vital statistics is provided by the surveys conducted by the All-India Institute of Hygiene and Public Health, in Singhur

<sup>1</sup> *Report of the Inter-Departmental Committee on Official Statistics* (Simla, Government of India Press, 1946), pp. 11-12.

village in West Bengal, by the Poonamallee Health Unit near Madras, and in Travancore by the Department of Public Health. Personal opinion of experienced individuals is practically unanimous about the unsatisfactoriness of present figures. Madras is probably the province which is least faulty in respect of vital statistics but even in the case of Madras about 15 per cent of births and 20 per cent of deaths go unreported.

*Registration:* Registration of births and deaths is compulsory in all Cities, Municipalities and Notified Areas under Municipal rules even where Provincial Acts do not exist. In rural areas registration is voluntary except in West Bengal, Bihar, Madras and Travancore. But even in regions where registration is mandatory practically nothing is done to enforce the law in this respect. It is not considered expedient to undertake prosecutions so long as the civic sense in this respect is not keener than at present and so long as the reporting and registering agency continues to be as indifferent to quality as at present.

*Primary Agency:* The reporting agency in rural areas is almost everywhere the village *Chowkidar*. These are mostly illiterate, ill paid and have no incentive for conscientious performance of their statistical duties. In Madras, however, we were informed that the village headmen who are responsible for the reporting of births and deaths are given special training and are required to pass a test. In Travancore the work is being taken away from the existing agencies and a special staff under the direct control of the Public Health Department is being employed. One of the reasons why the reporting is unsatisfactory and irregular is stated to be the ridiculously low salary of the primary reporting staff. We were told that if *Chowkidars* were warned, they refused to do the job; if they are dismissed no replacements are found.

In most provinces the present arrangements necessitate the reports originating in the Police (or Revenue) departments, passing first to the Civil Surgeons in the Medical Department who transmit the same to the headquarters of the Public Health Department. Compilation is also done at successive stages at the Police Stations, District Headquarters and finally at the Provincial Headquarters. This not only causes delay and introduces omissions and errors but also makes it impossible to have many of the detailed tabulations that may be of interest.

*Central Compilation:* In Mysore this system was changed and what is called central compilation introduced some time back.

In the Mysore system the village registrars send a copy of the primary registration form direct to the Headquarters Office for tabulation, though another copy of the same passes upward through the usual channels. These are filed in the Headquarters Office and used as a permanent record which forms the basis for the issue of birth and death certificates as and when required.

*Improvement of Registration:* For an improvement of registration the first requirement is an adequate primary and supervisory staff. One wholtime Registrar for about 20,000 to 30,000 of population is considered adequate in most of the provinces. Uniform legislation in all the regions making the registration of births and deaths (and if possible also marriages) mandatory will have to be put into force. But more important than legislation is the development of a civic responsibility in the matter of registering vital events.<sup>1</sup>

And last, the 1951 *Census Report of India* and the Paper on the *Estimation of Birth and Death Rates in India during 1940-50-51* reveal that the matter of correct and complete registration of vital events is still not under control. The Census Commissioner points this out in the simplest possible terms:

If reporting is complete and the basic (vital statistical) records are correctly maintained, the changes in numbers recorded by the Census at ten-yearly intervals should tally with the balance of births and deaths during the ten-year period, leaving a relatively small margin to be explained by the net balance of migration of people, in and out of the territory in question. . . . This incompleteness is indicated by Census results in another way also. The births registered during ten years work out to a rate (in round figures) of 25 per 1000 people per annum. We have already noted that the count of infants in the state (Madhya Pradesh) yielded 33 per 1000. Maybe this number was somewhat swollen by counting 13-month-old babies also, as infants. But, even so, if we make allowance for the number of infants who must have died during the year preceding the Census, the Census count of infants is a clear indication that actual births must have exceeded registered births substantially.

The problem is — how can we have a reasonably close estimate of the actual number of births and the actual birth rate as

<sup>1</sup> N. T. Mathew and P. Pant, *Report on the Present Statistical Organization in Provinces and States* (New Delhi, 1949), pp. 22-5.



against the registered birth rate? There is a similar problem about deaths and death rates.<sup>1</sup>

The following table gives an official estimate of the range of under-registration in the various Indian states (arranged in the order of their efficiency of registration) for the decade 1941-50.<sup>2</sup>

TABLE NO 3. *Registered and Estimated Birth and Death Rates in India, 1941-50*

State	Mean decennial birth rate		Percentage of unregistered births to estimated total number of births
	Registered birth rate	Estimated birth rate	
Madras	30.8	36	15
Madhya Pradesh	37.0	44-45	16-18
Bombay	32.9	42	22
Orissa	28.2	39	28
Uttar Pradesh	24.8	38-39	35-36
Bihar	21.9	39	44
West Bengal	20.5	37	45
Travancore-Cochin	20.3	37	45
Mysore	16.2	37-39	over 50

This survey of the original and largely unverifiable source material, namely population census and vital statistics during the last fifty years, reveals the value and validity of the material available to the student of Indian demography. In one sense, one is grateful that such a relatively complete series for half a century is available, and in another sense one despairs of its innate reliability when all the possible adjustments and refinements have been effected. No matter what corrections are made and no matter what sampling technique is used, there is really no alternative to complete and one hundred per cent registration throughout the year and a full quinquennial or decennial census count. This is true despite the numerous advantages of sampling such as economy of money, time and energy. Thus India is still far off from any ideal and desirable vital statistical set-up.

As the present study covers a rather long time series of half a

<sup>1</sup> *Census of India, 1951, Vol. I (India) Part 1 Report* (New Delhi, Government of India Press, 1953), pp. 78-9.

<sup>2</sup> *Census of India: Estimation of Birth and Death Rates in India during 1941-50*, Paper No. 6 (New Delhi, Government of India Press, 1954), p. 18.

century it has been found necessary to trace the evolution of the relevant statistical data in India, their overall worth and the trends they can be made to yield. This is what is available in the general field of population census and vital statistical data.

### *Sources for Infant Mortality Study*

For a study of Infant Mortality in India during the last fifty years two kinds of direct statistical data are available: (a) official records, and (b) unofficial studies. Both by virtue of their content and methods of compilation, they are of limited value.

The official sources are the series of Reports on Sanitation and Public Health issued by the authorities of the Government of India. The first series are the *Annual Reports of the Sanitary Measures Taken in India*. These are principally concerned with the protection and promotion of the health of British and Indian troops, jails and ports and the civilian population. These Reports simply record the number of total births, deaths and infant deaths for the area under registration, an area that has been growing steadily from year to year. The only other detail that some of these Sanitary Reports give is the Infant Mortality Rate by sex, namely the number of male and female infant deaths per 1000 male and female live births. The authors of these Reports (printed in England by the order of the House of Commons) express considerable diffidence as to the accuracy of the figures but a modern student of the subject is grateful to them, such as they are, for although defective and not really adjusted to the slowly growing registration area, they cannot be too wide of the mark.

This series of *Reports on Sanitary Measures in India* begins from the year 1864-65, as the *Annual Reports of the Sanitary Commissioner with the Government of India*. As new concepts of the role of a Government in promoting the public health of a country began to emerge, the Government of India appointed in 1920 a Public Health Commissioner in the place of the Sanitary Commissioner and from that year the publication became the *Annual Report of the Public Health Commissioner with the Government of India* for the year concerned. With the advent of freedom in 1947, it was decided to integrate and centralize the medical and public health activities of the Government of India (actually a recommendation of the Bhole Commission Report of 1943). The designation of the authority was changed to that of the Director-General of Health Services and the volume became the *Annual Report of the Director-General of Health Services* with an accompanying volume of statistical appendices.

There are also, as pointed out already, the comprehensive reports of India's decennial censuses, the *Census Reports of India* which began in 1872 and have been issued in a more or less uniform manner every ten years (except in 1941) down to 1951.

On the same lines, we have the Provincial Reports on Public Health and Population Census. There are the *Annual Report of the Director of Public Health* and the decennial *Report of the Census* for the various provinces and states. In addition, there are the *Annual Reports of the Executive Health Officer* for certain major cities such as Bombay, Calcutta, Madras, etc. These are the official and unverifiable sources of primary demographic data for India.

As distinct from these Government Reports, a few studies by individual social scientists, government officials and medical personnel are available. These are in the nature of private and academic *ad hoc* studies. With reference to mortality in general and infant mortality in particular, their scope and objectives are very limited as they deal with random and select samples of population such as a village, a famine-affected area, patients of a particular hospital or some selected villages and towns in the country. Though these studies cover only small samples of population, they are of some value, for such facts and trends as they do establish may prove to be either corrective or corroborative of official figures. A comparison between these two sets of official and unofficial figures, where possible, proves instructive, if the limitations of such a comparison are not overlooked.

These then are the available data and their limitations. They indicate the nature of research needed to tackle a problem like that of Infant Mortality in an under-developed country. The problem before us can be expressed in the words of Professor Bradford Hill as pointed out in his 1953 Cutter Lecture at the Harvard School of Public Health: 'One must seek more facts, paying less attention to techniques of handling the data and far more to the development and perfection of methods of obtaining them.'<sup>1</sup> Whether it is medical statistics or demographic data or both as in the case of Infant Mortality, the need is the same — 'mehr licht'.

<sup>1</sup> Bradford A. Hill, 'Cutter Lecture at the Harvard School of Public Health', *New England Journal of Medicine* (1953), pp. 995-1001.

## CHAPTER II

# Measurement of Infant Mortality

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### *What is Infant Mortality?*

FOR demographic statistical purposes, all children under one year of age are considered 'infants' and so the term 'infant mortality' refers to mortality among children of less than one year of age.

### *Importance of the Study*

The importance of the study of infant mortality cannot be over-emphasized if we consider the fact that in most underdeveloped countries one out of every five, sometimes even one out of every four infants, dies before completing its first year of life. In fact, even in advanced countries where the health conditions for infants are the best in the world, the first year of life remains the most vulnerable period (barring very old age, say above 70 years).

Since infants, more than any other section of the population, depend to a large extent on the environmental conditions for their survival, it would not be far wrong to say that the death of an infant in most cases is due to poor and insanitary environment. And environment being something that society can improve considerably, a high rate of infant mortality would indicate that all that the society can do to improve the environmental conditions has not been done. Hence the infant mortality rate may be taken as a reliable and sensitive index of the total health conditions of a community or a country.

### *Definition of the Infant Mortality Rate and other Connected Terms*

The infant mortality rate may be defined as the number of infant deaths that occur per thousand live births in any population in one calendar year. From the very definition it is obvious that the infant mortality rate does not take into account either foetal deaths or stillbirths, but only live births and infant deaths. But what do we mean by the terms 'live births', 'foetal deaths', 'stillbirths' and 'infant deaths'? The Third Assembly of the World Health Organization of the United Nations, early in 1950, recommended the following definitions for international use in this connection:

*Live birth* is the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration

of pregnancy, which after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached: each product of such a birth is considered live born.

*Foetal death* is death prior to the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy; the death is indicated by the fact that after such separation the foetus does not breathe or show any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles.

All live-born infants should be registered and counted as such irrespective of the period of gestation, and if they die at any time following birth they should also be registered and counted as deaths.<sup>1</sup>

So, an '*infant death*' is the death of any live-born child before it completes its first year of life.

In addition, the Third World Health Assembly also recommended the 'tabulation of live births and foetal deaths in the following four groups according to the length of gestation measured from the beginning of the last menstruation:

Less than 20 completed weeks of gestation	Group I
20 completed weeks of gestation but less than 28	Group II
28 completed weeks of gestation and over	Group III
Gestation period not classifiable in Groups I, II and III	Group IV <sup>2</sup>

The foetal deaths in Groups I, II and III above were called 'early foetal deaths', 'intermediate foetal deaths', and 'late foetal deaths' respectively, and 'stillbirths' were considered synonymous with 'late foetal deaths'.

These definitions, though given as early as 1950, are yet to be implemented by the different countries with the consequence that international comparisons of infant mortality statistics suffer from the divergent usage of the terms 'live births', etc.

### *The Conventional Infant Mortality Rate*

From the definition of the infant mortality rate as given earlier it will be seen that for its proper calculation, the so-called Cohort-Analysis

<sup>1</sup> *Foetal, Infant and Early Childhood Mortality, Vol. I* (New York, United Nations, 1954), p. 4.

<sup>2</sup> *Foetal, Infant and Early Childhood Mortality, Vol. I*, p. 4.

Method has to be adopted. That is to say, we have to follow a 'cohort' of 1000 live-born children through their first year of life and record the number of deaths among them during that period to arrive at the correct infant mortality rate. But since this procedure has been found difficult to follow due to administrative and other difficulties, a modified infant mortality rate called the 'conventional infant mortality rate' has generally been adopted. The conventional infant mortality rate is defined as the number of infant deaths that occur during a given period of time, usually a calendar year, per 1000 live births during the same period, in a given population.

### *Data Needed*

A detailed, serious and profitable study of Infant Mortality in any community or country, however (and particularly in a large and heterogeneous country like India), must be based on an adequate knowledge of the complex biological, economic, social and cultural factors affecting the health, morbidity and mortality of infants.

We need precise and adequate information on no less than some twenty-five points. First, the mother's physical condition, the mother's age, the number of children she has borne (her parity), month and season of the birth; order of births; interval between births; employment, if any, of the mother during pregnancy and during the first year of the infant's life; sex of the infant; duration of marriage; if no marriage, the nature of the union (illegitimacy) such as common law marriage, temporary concubinage or casual affair, etc.; whether the birth was premature (infant weighing  $5\frac{1}{2}$  lb. or below), single or multiple.

Secondly, and more important, precise information is needed on the age of the infant at death; type of feeding such as breast-feeding, bottle-feeding and any cultural peculiarities in infant feeding; pathological cause of death; and whether the infant had received any medical aid. The last two items and even the age of the infant are often difficult to obtain in an under-developed country like India where the public health services particularly in rural areas are neither adequate nor efficient.

Thirdly, we must go beyond the pathological cause to antecedent and predisposing causes and causal factors. Hence we need some reliable information on the father's occupation, the family's income, and if possible, the educational status of the mother and preferably of both parents. As residential conditions matter a great deal in any country and particularly in India, where a majority of the population have sub-standard rural and

urban housing, information on the housing conditions are needed, such as thatched hut or brick-built house, and the presence, if any, of sanitary conveniences; residence of the family, whether rural or urban, village, town or city; knowledge of the family's religion and language as indicative of the cultural *mores* will also be useful. If the infant death was a case of still-birth, peri-natal or neo-natal mortality (and for all confinements for that matter) we need information on the nature of the confinement (normal delivery, instrumental delivery or Caesarian section, etc.), whether the delivery was in the home or in a hospital; if at home, whether there were any medical helpers (doctor, midwife, etc.). Any other information of a clinical and case-history nature, besides a knowledge of the home and upbringing, particularly of the mother, would be helpful.

And, last but not least, are health, welfare and survival of the mother herself. The sickness, disability or death of the mother within one year after confinement has an enormous influence on the survival of the infant.

If the study is to be a comprehensive inquiry into all vital losses up to the age of one year, social, medical and environmental details from conception should be ascertained: abortion (spontaneous or induced), period and the immediate cause; premature births (any viable infant weighing  $5\frac{1}{2}$  lb. or 2500 grammes or less being specified as immature or premature); and stillbirths (any infant born after the 28th week of pregnancy who did not at any time breathe or show any other sign of life). And for an analysis of stillbirths, a knowledge of the following factors would be helpful: type and duration of delivery; primary medical cause of stillbirths; history of previous pregnancies; health of the mother; nutritional assessment of the mother's diet during pregnancy; mother's employment, if any, during pregnancy; and history of sexual intercourse during pregnancy.<sup>1</sup>

However, conventionally, stillbirths and foetal deaths are not treated as a part of infant mortality in most countries. And therefore in this study, still-births and foetal deaths are not treated as a part of infant mortality.

### *Data Generally Available*

While data on the above categories may be considered as almost the requisite minimum, no information on most of these factors is

<sup>1</sup> S. Chandrasekhar, 'Some Observations on Infant Mortality in India: 1901-1951', *Eugenics Review* (London), January 1955, p. 214.

available for India as a whole (undivided India as well as for the present registration area of the Indian Union) or even for the former British provinces (British India) which are usually taken as the regular registration area in all discussions of Indian demography.

However, apart from the general demographic data available from the decennial Census and annual vital statistical reports as already described, some specific but incomplete data are available for some provinces as to the age, sex of the infant, rural or urban residence, sometimes the caste and religious affiliation of the family, and occasionally medical attestation of the cause of death, but the latter information is given in a majority of cases (unattended by medical personnel) by someone such as a parent, a relative, village headman or police official who is not medically qualified to do so. Thus information on the cause of infant deaths can only be taken relatively seriously in certain cities where some effort is made to ascertain the cause, to the best of the ability of the registration personnel. In view of this deplorable situation, which has not improved in recent years despite India's valiant efforts at progress in many directions, a plea for a complete reorganization of the machinery for vital registration all over India becomes necessary. It need hardly be added that mere vital registration as far as mortality is concerned without medical attestation will be to a great extent without any value. Such a reorganization can only be achieved when the public health system embraces the majority of the population which lives in India's far-flung villages. The formidable cost of any such organization — public health personnel as well as registration agencies — is not minimized, but there appears to be no sense whatsoever in a Government trying to fight the inordinate morbidity and mortality of a people and particularly of its most defenceless and vulnerable section, infants, when the authorities are largely ignorant of the exact number and the basic and pathological causes of sickness and death. Any worthwhile policy must be based on unquestionable facts. But in the absence of factual and acceptable data, the public health and related policies of the Government are no better than the proverbial blind man searching in a dark room for a black cat which was not there.

And yet there is no point in despairing, for when the ideal is unattainable, we must manage with the available. We must make do with the next best or any workable alternative. This long list of desirable but unobtainable data is cited not with any defeatist purpose but to highlight the more or less ideal set-up we should eventually aim at and hope for in our country.<sup>1</sup>

<sup>1</sup> S. Chandrasekhar, *Census and Statistics in India* (Chidambaram, Annamalai University, 1948), *passim*.



*Computation of the Infant Mortality Rate**True Infant Mortality Rate*

The true infant mortality rate, defined earlier, would involve, apart from the live births in a given calendar year, the deaths of infants in that calendar year from among the live births in that same year plus the deaths of infants in the next calendar year from the live births in the previous calendar year. Let us consider this symbolically:<sup>1</sup>

Let  $b_x$  be the total number of 'live births' in the calendar year  $x$   
 $d_x^x$  be the total number of 'infant deaths' in the calendar year  $x$  from out of the live births in the same calendar year  $x$   
 and  $d_{x+1}^x$  be the total number of 'infant deaths' in the calendar year  $(x+1)$  from out of the 'live births' in the calendar year  $x$   
 Then the 'true infant mortality rate'  $I$  is given by:

$$I = \frac{d_x^x + d_{x+1}^x}{b_x}$$

The following two components, with deaths related to population at risk, are involved in this rate  $I$ :

$$I_1 = \frac{d_x^x}{b_x} = \text{proportion of infants born and dying in the same calendar year } x$$

and

$$I_2 = \frac{d_{x+1}^x}{b_x - d_x^x} = \text{proportion of infants born in and surviving the calendar year } x, \text{ dying in the calendar year } x+1 \text{ as 'infants'}$$

therefore  $(1-I_1)(1-I_2) = \text{proportion of 'live births' in the year } x \text{ surviving their first year of life}$

therefore  $1-(1-I_1)(1-I_2) = \text{proportion of 'live births' in the year } x \text{ that die before completing the first year of life}$   
 $= I.$

Thus the computation of the true infant mortality rate would require that deaths be tabulated by the year of occurrence, age at death and by the year of birth of the deceased, which is seldom done in any country. Even granting that death registration is done in such detail and that the registration is complete (which is not at all true of many countries of the world), for computing the true infant mortality rate for the current calendar year one will have to wait till the end of the next calendar year.

*Refined Infant Mortality Rate*

To obviate this difficulty, however, Dr. Valaoras<sup>2</sup> has proposed the 'refined infant mortality rate'. Using the same notation as before, this 'refined infant mortality rate' consists of two components:

<sup>1</sup> Adapted from *Foetal, Infant and Early Childhood Mortality*, Vol. I, pp. 10-11.

<sup>2</sup> Vasilios G. Valaoras, 'Refined Rates for Infant and Childhood Mortality', *Population Studies* (London), Vol. IV, No. 3, December 1950, pp. 253-66.

$$d_x^x$$

$$\text{and } i_2 = \frac{d_{x-1}^{x-1}}{b_{x-1} - d_{x-1}^{x-1}}$$

where  $d_{x-1}^{x-1}$  = deaths of infants in the year  $x$  out of live births in the year  $(x-1)$   
 $b_{x-1}$  = live births in the year  $(x-1)$

and  $d_{x-1}^x$  = deaths of infants in the year  $(x-1)$  from among the live births in the year  $(x-1)$ .

The 'refined infant mortality rate' is then given as:  $I_R = 1 - (1 - i_1)(1 - i_2)$

It would be observed that  $i_1$  here is the same as  $I_1$  of the 'true infant mortality rate'. The  $i_2$  here is comparable to  $I_2$  of the true rate, but is instead based on data belonging to the previous calendar year. This  $i_2$  would be a close approximation to  $I_2$  as long as infant mortality is not changing rapidly from year to year, irrespective of the trends in birth rate. The refined rate, it may be pointed out, makes use of the deaths of infants occurring in only one year.

### *Modified Infant Mortality Rate: Separation Factors*

As pointed out earlier, the 'true' as well as the 'refined' infant mortality rates require that the year of birth of the infants who have died be known and this information is not always readily available. However, an estimate of the proportion of infant deaths in a calendar year belonging to births in the same year to the total number of infant deaths in that calendar year can be made and this estimate is known as the 'separation factor'.

It may be recalled that in the case of the 'conventional infant mortality rate', the total infant deaths occurring in a given calendar year are related to the total live births during that calendar year. This conventional way of expressing the infant mortality rate would, however, be correct if all the infants who died in a particular year were also born in the same year, presuming complete registration. In fact, however, infants who died before completing their first year of age in 1951, for instance, are the babies born in 1950 who died in 1951 before completing their first year and those born in 1951 who died before the end of that year. The conventional way will be approximately correct if the number of births in the year before was more or less the same as that in the current year. But if births in the previous year are considerably higher or lower, the conventional infant mortality rate is apt to be misleading and will remain at best a crude one.

However, this drawback could be overcome by using the 'separation factor' and in fact several attempts have been made in the application of this device. The most exhaustive of these is the study

of Moriyama and Greville<sup>1</sup> who proposed that the infant deaths of any year be re-allocated to the corresponding cohorts of births, and the adjusted infant mortality rate be calculated as follows:

$$\text{Adjusted infant mortality rate} = \left[ \frac{d_x f}{b_x} + \frac{d_x (1-f)}{b_{x-1}} \right] \times 1000$$

where

$d_x$  = number of infant deaths in the calendar year  $x$ .

$f$  = proportion of deaths under 1 year of age which were deaths of infants born and dying in the same calendar year = (separation factor).

$b_x$  = live births in the calendar year  $x$ .

$b_{x-1}$  = live births in calendar year  $(x-1)$ .

It may be pointed out, however, that the separation factor for a given area may not remain constant from year to year. It can be seen that if infant mortality goes on decreasing, an increasing percentage of infants dying during a calendar year would be drawn from the live births during the same year thus increasing the separation factor. Similarly if the live births in a given year are more than those in the previous year, the separation factor for the given year will increase. However, some test calculations, which have been made to check this, indicate that within the range of likely annual changes in the live births and infant mortality rate, the separation factor remains stable over a period of 5 to 10 years.

### *Calculation of Separation Factors*

Now let us consider the methods of calculating the separation factors. The three possible methods of calculating the value of separation factors are:

- (i) the method of analytical reasoning based on the assumption of a uniform distribution of deaths over the first year of life;
- (ii) the method of using past statistical data; and
- (iii) the method of using regression lines.

#### *(i) Method of Analytical Reasoning*

The separation factor could be used either to allocate the deaths in the current calendar year to the live births in the previous and current calendar years appropriately, in which case it is known as 'numerator separation' or to calculate the related births to deaths at each interval of the first year of age in the current calendar year, in which case it is known as 'denominator adjustment'. These two

<sup>1</sup> I. M. Moriyama and T. N. E. Greville, 'Effect of Changing Birth Rates upon Infant Mortality Rates', *U.S. Vital Statistics Special Reports, Vol. XIX, No. 21*, November 10th, 1944, pp. 401-12.

procedures may be examined in some detail as they happen to differ slightly.

(a) *Numerator Separation.* The basic requirement before 'numerator separation' can be applied is that the number of live births in the current and previous calendar years are known separately in addition to the number of deaths in the current calendar year tabulated by age at death. Once this information is available the problem is to allocate the deaths in each sub-division of age to the births in the current and previous calendar years. For example, if the age at death is tabulated as under 1 day, 1, 2, 3, 4, 5, 6 days, 7-13 days, 14-20 days, 21-27 days, 28 days-2 months and by single months of life from 2 months to 1 year, the problem is to allocate the number of deaths in each of these age groups to the births in the previous and current calendar years. The finer the subdivisions of age at death the more accurate the separation factor becomes.

The logic of this method can be illustrated as follows: let  $d_1$  be the number of deaths of children aged  $a_1$  to  $a_2$  months in the current calendar year. Now it can be seen that *all such deaths* occurring in the first  $a_1$  months of the current calendar year should belong to the births in the previous calendar year and all such deaths occurring *after* the  $a_2$ th month of the current calendar year should belong to the births of the current calendar year. It is the deaths of infants aged  $a_1$  to  $a_2$  months occurring between the  $a_1$ st and  $a_2$ nd months of the current calendar year that present a problem. But conventionally it is taken that *half* of these deaths belong to the births in the previous calendar year and the other half to births in the current calendar year. If it is assumed that the deaths of infants aged  $a_1$  to  $a_2$  months is uniformly distributed over the year, the proportion of such deaths assigned to the previous calendar year would be

$$\frac{a_1 + \frac{1}{2}(a_2 - a_1)}{12} = \frac{a_1 + a_2}{24}$$

and the proportion assigned to the current calendar year would be

$$1 - \left( \frac{a_1 + a_2}{24} \right)$$

That is, if the number of infant deaths in the current calendar year tabulated by age at death is available, these deaths — by a simple arithmetical procedure — can be allotted to the appropriate births in the previous and current calendar years. The procedure is to multiply the number of deaths in each sub-group of age by the appropriate proportions and add the resulting figures.

It may be noted here that when there are only two subdivisions of infant deaths as neo-natal (infants below 28 days of age) and post

neo-natal (infants aged above 28 days and below 1 year), the proportions assigned to the previous year are *zero* and *half* respectively. This is a rather simplified but less accurate method of 'numerator separation'.

(b) *Denominator Adjustment.* The problem here is not one of allocation of deaths in the current calendar year to the births in the previous and current calendar years, but one of calculating the related births to deaths at each age. That is to say, the 'crude' denominator — the number of births in the current year — is adjusted by increasing or diminishing it a certain amount so as to make allowance for a different number of births in the previous year.

Let the total number of live births in the  $x$ th and  $(x+1)$ th calendar year be  $b_x$  and  $b_{x+1}$  respectively. Consider the deaths of infants of age  $a_1$  to  $a_2$  months in the current, that is,  $(x+1)$ th calendar year. If now we assume that the births in the  $x$ th as well as the  $(x+1)$ th calendar years are uniformly spread over the years, then the number of births to which these deaths of infants of age  $a_1$  to  $a_2$  months in the current calendar year are related are:

$$\left[ \frac{a_1 + a_2}{24} \right] b_x + \left[ 1 - \frac{a_1 + a_2}{24} \right] b_{(x+1)}$$

$$= b_{x+1} + \frac{a_1 + a_2}{24} (b_{x+1} - b_x)$$

Now, dividing the deaths of infants of age between  $a_1$  and  $a_2$  months in the current calendar year by the related births given above, and multiplying by 1000, we get the mortality rate for ages between  $a_1$  and  $a_2$  months. Similarly we can calculate the mortality rates for all sub-divisions of age under 1 year and the sum of all these rates will give us the required infant mortality rate. In general this may be written as

$$\text{I.M.R. for year } (x+1) = \frac{d_{x+1}}{r b_x + (1-r) b_{x+1}} \times 1000$$

where 'r' is the adjustment factor for births.

### (ii) *Method of Using Past Statistical Data*

The method of analytical reasoning described above, would be valid only if the assumption of a uniform distribution of deaths and births occurring in a year, over the year, is valid. But it is too well known that births and deaths in a year are subject to considerable seasonal fluctuations and therefore it would be better if we could make use of the statistical data, if available, of a normal period. That is, if for any normal year we have the number of deaths of

infants classified by age at death and year of birth, we can calculate the proportion of deaths in the current calendar year which springs from the births in the previous calendar year and this proportion could be used for allocating deaths in the future years.

### (iii) *Method of Regression Lines*

If in any country, the crude infant mortality rates for a number of years and the corresponding separation factors are available, it is possible to fit an appropriate regression line taking the separation factor as the dependant variable  $Y$  and the crude infant mortality rate as the independent variable  $X$ . From this regression line, the separation factor can be estimated if the crude infant mortality rate is known for any year.

This method has been applied by Valaoras in the case of Scandinavia, where for a number of decades vital statistics have been carefully collected. The following was the regression line fitted by Valaoras:

$$\text{Log } (Y-50) = 1.490173 - 0.005153 X$$

where  $Y$  is the separation factor and  $X$  the crude infant mortality rate. The regression line reflects the fact that the infant mortality rate registered a declining trend in that country. Actually, the infant mortality rate declined from about 85 to about 30 per thousand live births during that period.

The ready application of the regression line given above is possible only in countries where the level of infant mortality is more or less the same as that in Scandinavia and also only if it shows a declining trend. Moreover, the application of this method may give misleading results in countries where the age distribution of infant deaths at a given level of infant mortality rate does not conform to the Scandinavian pattern.

### *Infant Mortality Rate in Life Tables*

An essential element in the computations involved in the construction of Life Tables is the mortality rate in the first year of life denoted by  $q_0$ . The usual method of calculating the mortality rates for the construction of Life Tables is to employ both the census figures and the registered deaths. But on account of the unreliability of the numbers enumerated at infantile ages (0 to 5 years) by the census, it has become customary to discard the census figures at these ages as incorrect and to use the birth and death registration figures for the calculation of the mortality rates at these ages.

(a) *English Life Table Methods*

The basic assumption employed in the construction of English Life Tables 1 to 8 was that there was a uniform progression in the movement of the population over the year of age — i.e. it was assumed that deaths between the attainment of age 'x' and the end of the calendar year 'Z' was equal to the deaths between the beginning of the calendar year (Z+1) and attainment of age (X+1). Allowance for varying births and deaths in the different calendar years was made by using the data of a number of calendar years. The method used to calculate the mortality rate in the first year of life was essentially the 'denominator adjustment' approach which has been discussed earlier. By this method:

$$\text{Infant mortality rate for the year } (x+1) = \frac{d_{x+1}}{r \cdot b_x + (1-r) b_{x+1}}$$

where  $d_{x+1}$  denotes the deaths of infants in the year  $x+1$ , and  $b_x$  and  $b_{x+1}$  denote the live births in the years  $x$  and  $(x+1)$  respectively. In the case of the English Life Tables 1 to 8,  $r$  was taken to be equal to 0.5 and the infant mortality rates were calculated.

In the case of English Life Tables 9 and 10, however, there was some change. Since it was found that there were violent fluctuations in the number of births during and after the war of 1914-18, the earlier assumption of uniform distribution of births over the year was abandoned, and since as returns of births and deaths were available for each quarter of each calendar year, it was assumed that the births and deaths in each quarter were distributed uniformly. Again the method used for the computation of the mortality rate  $q_0$  was essentially the 'denominator adjustment approach'.

From the available data, the probabilities that a child:

- (1) will die in the first quarter year of life,
- (2) will survive the first quarter year of life but will die before the end of the second quarter,
- (3) will survive both the first and second quarters of life but will die in the third quarter, and
- (4) will survive the first three quarters of life but will die in the last quarter of the first year of life, were calculated.

The sum of these four probabilities yielded the required infant mortality rate, as shown in the following table.<sup>1</sup>

<sup>1</sup> W. P. D. Logan, 'The Measurement of Infant Mortality', *Population Bulletin*, No. 7 (New York, United Nations, October 1953), pp. 55-6. I am indebted to Dr. Logan's excellent article and this part of the chapter is largely based on his reasoning.

TABLE NO 4. *Details of the Computational Method used in English Life Tables 9 and 10 for the Calculation of the Infant Mortality Rate*

Quarter period	Quarter year of age	Deaths D <sub>i</sub> (Numerator)	Related Births B <sub>i</sub> (Denominator)
1	0-2 months	$1d_{0+1}d_{1+1}d_{2+1}$	$\frac{1}{3} \times 4b_{-1} + b_0 + b_1 + b_2 - \frac{1}{3} \times 4b_3$
2	3-5 months	$2d_{0+2}d_{1+2}d_{2+2}$	$\frac{2}{3} \times 3b_{-1} + 4b_{-1} + b_0 + b_1 + 1b_2 + 2b_3 + \frac{1}{3} \times 3b_4$
3	6-8 months	$3d_{0+3}d_{1+3}d_{2+3}$	$\frac{1}{3} \times 2b_{-1} + 4b_{-1} + 4b_{-1} + b_0 + b_1 + 1b_2 + \frac{1}{3} \times 2b_3$
4	9-11 months	$4d_{0+4}d_{1+4}d_{2+4}$	$\frac{1}{3} \times 1b_{-1} + 2b_{-1} + 4b_{-1} + 4b_{-1} + b_0 + b_1 + \frac{1}{3} \times 1b_2$

$$\text{Now } a_0 = \frac{D_1}{B_1} + \frac{D_2}{B_2} + \frac{D_3}{B_3} + \frac{D_4}{B_4}$$

and

$s^d_t$  = deaths in the  $s^{\text{th}}$  quarter of life in calendar year 't'.

$n^{b_t}$  = births in the  $n^{\text{th}}$  quarter of calendar year 't'.

$b_t$  = births in the entire calendar year 't'.

### (b) United States Life Tables

In the United States, a survey of the registration of vital statistics carried out along with the census in 1940 revealed that the under-registration of births and deaths was more or less of the same order and so the infant mortality rate could be calculated by using the 'numerator separation' method described earlier. By this method, the 'infant deaths' in the year were allocated to births in the previous and current years and then the Valaoras method of calculation of the 'Refined Infant Mortality Rate' was used to arrive at the infant mortality rate.

### (c) Indian Life Tables

In India, Life Tables have been constructed on the basis of a comparison of the enumerated figures at the successive Censuses. To calculate the infant mortality rate, the following method has been adopted. The recorded births in each year of the intercensal period are compared with the surviving numbers enumerated in the second Census, assuming the effects of migration to be negligible. The survival ratios are computed and compared with those in existing Life Tables of other countries and if any table is found which has nearly comparable survival ratios, then 'proportional factors are formed from the ratio of deaths in infancy to total deaths from birth to successive ages in this life table'.<sup>1</sup> If these ratios are multiplied by the differences between the census enumeration and recorded births, estimates of infant deaths in the intercensal years are obtained. Thus with the annual births available, the infant mortality rate is calculated by the conventional method. The rate so obtained

<sup>1</sup> W. P. D. Logan, *op. cit.*, p. 57.



is a crude one and is necessarily a rough approximation to the correct infant mortality rate.

### *Bourgeois-Pichat Measure of Infant Mortality Rate*

M. Bourgeois-Pichat,<sup>1</sup> the French demographer, found that deaths in the first year of age could not all be placed under the same category since part of them were caused by 'endogenic' causes and the rest by 'exogenic' causes. The deaths classified under the former category would consist of those cases in which the child 'bears within itself, from birth, the cause resulting in its death, whether that cause was inherited from its parents at conception or acquired from its mother during gestation or delivery'.<sup>2</sup>

The second category would comprise deaths of infants due to the effect of the environment in which they live. Bourgeois-Pichat's contention is that this classification is important from the medical point of view, since the preventive measures designed to reduce the endogenic causes of mortality are different from those that are effective against exogenic causes. Also, by this method of distinguishing the exogenic component from the endogenic component, the difficulty inherent in the total infant mortality rate as to whether any of the early deaths have been omitted or mis-classified as stillbirths can be avoided.

Once we accept the above argument of the necessity for the classification of infant deaths into 'exogenic' and 'endogenic' deaths, we have to adopt some method to effect this classification. The simplest way to achieve this would be to classify all infant deaths into these two groups according to age, rather arbitrarily, say deaths under 4 weeks of age and those over 4 weeks of age.

However, the method given by M. Bourgeois-Pichat attempts to provide a more accurate distinction between the two groups of deaths than can be achieved by a division of infant deaths arbitrarily at a selected age. His method is as follows: 'The "exogenous" rate is essentially a weighted average of the mortality rates for each month in infancy after the first; the "endogenous" rate is then the difference between the mortality rate for the first year of life and the "exogen-

<sup>1</sup> Jean Bourgeois-Pichat, 'De la Mesure de la Mortalité Infantile', *Population* (Paris, January-March 1946), pp. 53 *et seq.*

Jean Bourgeois-Pichat, 'Analyse de la Mortalité Infantile', *Revue de l'Institut International de Statistique* (1950, No. 1/2), pp. 45 *et seq.*

Jean Bourgeois-Pichat, 'La Mesure de la Mortalité Infantile', *Population* (Paris, April-June 1951), pp. 233 *et seq.*; *Population* (Paris, July-September 1951), pp. 150 *et seq.*

Jean Bourgeois-Pichat, 'An Analysis of Infant Mortality', *Population Bulletin* (New York, United Nations, October 1952), p. 1.

ous" rate.<sup>1</sup> The weights used in this calculation according to Bourgeois-Pichat are invariant both with respect to space and time. The application of this method to the data of England and Wales in 1950 is shown below in Table No. 5.

TABLE NO 5. *Calculation of 'Exogenic' Infant Mortality Rate, England and Wales 1950<sup>a</sup>*

Age (months)	No. of deaths	Cumulated deaths (up)	Rate per 1000 live births in 1950 (697,097)	(Weights) Co-efficient	(Rate) Co-efficient
1	2	3	4	5	6
1	1614	7900	11.33	.801	14.14
2	1398	6286	9.02	.654	13.79
3	1067	4888	7.01	.550	12.75
4	862	3821	5.48	.459	11.94
5	702	2959	4.24	.381	11.13
6	551	2257	3.24	.312	10.38
7	458	1706	2.45	.249	9.78
8	374	1248	1.79	.189	9.47
9	328	874	1.25	.139	8.99
10	296	546	.78	.089	8.76
11	250	250	.36	.044	8.18

Av. = 10.85

Exogenic rate = Average of Col. 6 = 10.85 per 1000 live births

Total Infant Mortality Rate = 29.86 per 1000 live births

Therefore, Endogenic Infant Mortality Rate = 19.01 per 1000 live births

The Bourgeois-Pichat method of calculating the 'exogenous' and 'endogenous' components of infant mortality lends itself to criticism on a number of points. First, it is not known as to what objective tests have been used to ascertain how accurately the calculated 'exogenic' and 'endogenic' rates actually measure the concepts they define. Secondly, as pointed out by Dr. Logan, if these rates are used for medical guidance, it is not known as to how these compare with the best that medical opinion has to offer, i.e. with the findings produced by careful clinical and pathological examinations. Thirdly, the two terms 'exogenic infant mortality' and 'endogenic infant mortality' have not been precisely defined. Lastly, the claim of universality of the weighting factors (or co-efficients) used by Bourgeois-Pichat is yet to be demonstrated. In the words of Dr. Logan: 'On the whole, it seems fair to say that Bourgeois-Pichat has

<sup>1</sup> W. P. D. Logan, op. cit., p. 60.

<sup>2</sup> Ibid., p. 54.

offered a novel and ingenious method for measuring certain aspects of infant mortality but that from the point of view of "medical statistics", the method offers no practical advantage over the existing methods.<sup>1</sup>

### *Standardization of Infant Mortality Rate*

A number of factors like sex, race, socio-economic circumstances, legitimacy, age and parity of mother, family size, etc., affect the infant mortality rate and so, for the purposes of comparison of infant mortality rates, it is necessary to standardize them. For example, Table No. 5a below shows the effect of the distribution of legitimate and illegitimate births on the crude infant mortality rate of area 'A' and 'B' and the method of standardizing them with reference to the distribution of legitimate and illegitimate births in a standard population.

TABLE NO 5a. *Standardization of Crude Infant Mortality Rates*<sup>2</sup>

	Legitimate		Illegitimate		Total
	Males	Females	Males	Females	
Standard births (e.g. National)	340,000	320,000	20,000	19,000	699,000
Distribution per 1000 total births	486	458	29	27	1,000
Area A					
Births	40,000	35,000	800	700	76,500
Deaths	1,600	1,050	48	35	2,733
	Crude Infant Mortality Rate = 35.7				
Area B					
Births	20,000	17,000	1,600	1,380	39,980
Deaths	780	493	94	68	1,435
	Crude Infant Mortality Rate = 35.9				
Deaths in a standard 1000 births					<i>Standardized Infant Mortality Rate</i>
Area A	19.44	13.74	1.74	1.35	36.3
Area B	18.95	13.28	1.70	1.33	35.3

In the above table, a comparison of the crude infant mortality rates for areas A and B reveals that area A seems to have a better infant mortality experience. But on a comparison of the standardized infant mortality rates — which are crude infant mortality rates adjusted for the effects of legitimacy by using the distribution of legitimate and illegitimate children in the standard population — it is seen that area B experiences a lower infant mortality than area A.

### *Applications of the Infant Mortality Rate*

#### *(i) Estimation of the Number of Births from Census Data*

Let  $n$  be the number of children under 1 year of age, on 1st July, and  $b$  be the total number of births during the one year ending 1st July.

<sup>1</sup> D. Logan, op. cit., p. 54.

<sup>2</sup> Ibid., p. 52.

previous to the date of the Census minus the infant deaths that have occurred during that one year. That is, if a census count of the children under 1 year of age on December 31st of any year be  $L_0$ , then  $L_0 = L - d$  where 'L' is the total number of live births during that calendar year and 'd' the number of infant deaths during the same year.

Dr. Giorgia Mortara<sup>1</sup> has shown that from a knowledge of  $L_0$ , we can estimate 'L', by making use of the infant mortality rate prevalent in that population. According to Mortara, two-thirds of the infant mortality takes place in the same calendar year of birth and only the remaining one-third in the following calendar year. Therefore, if  $L_0$  be the census count of children under 1 year of age on December 31st of any year, the number of live births during that calendar year can be calculated as:

$$L = L_0 / (1 - \frac{2}{3} \text{ of infant mortality rate per unit}).$$

The merit of this method lies in the fact that since the infant mortality rate in most countries of the world is known to lie in the range of .03 to .27 per unit, it is possible to give limits to the total number of live births in any year. But, however, caution should be exercised in making use of the census figures in the age 0 to 1, since it is subject to two types of errors. First, the reporting of children under 1 year of age may be imperfect and secondly, there is always a tendency among people to overstate the ages of their children under 1 year of age so that the Census count of children under 1 year of age is usually an underestimate.

### (ii) *Estimation of Under-registration*

Shri S. P. Jain,<sup>2</sup> the Actuary for the 1951 Census of India, has studied the extent of under-registration of births in India by a slight extension of the method described above.

Using Mortara's method, from the 1951 Census count of children under 1 year of age, the total number of live births in the year immediately preceding the census was estimated. Then

$$\left[ 1 - \frac{\text{(Registered number of births in the year immediately preceding the Census)}}{\text{(Estimated number of births in the same one year)}} \right] \times 100$$

gave the percentage of under-registration of births during that year.

<sup>1</sup> *Methods of Using Census Statistics for the Calculation of Life Tables and other Demographic Measures* (New York, United Nations, 1950), p. 3.

<sup>2</sup> S. P. Jain, 'Computed Birth and Death Rates in India during 1941-50', *Census of India, 1951, Part I-B, Annex 2*, p. 150.

In this connection, Jain has shown that even if Mortara's assumption of the proportion of infant mortality taking place in the same calendar year as two-thirds, varied between seven-tenths and three-quarters, and the infant mortality rate varied from 80 to 250 per thousand, the relative error in the estimated number of births by this method would be small. The following table shows, 'the percentage by which the estimated births come out to be higher than the number obtained by taking  $r = \frac{2}{3}$  and  $I = 80$ '.<sup>1</sup>

TABLE NO 5b. *Percentage Increase in the Number of Estimated Births for Different Values of 'r' and Infant Mortality Rate*<sup>2</sup>

Infant Mortality Rate	$r = 2/3$	$r = 7/10$	$r = 3/4$
80	...	0.3	0.7
160	6.0	6.6	7.6
250	11.4	14.5	16.6

### Conclusion

The foregoing discussion reveals the difficulties in the calculation of infant mortality rate, particularly in under-developed countries like India where accurate and reliable vital statistics are not available. We do not have even the correct basic data like total number of births, total number of deaths of infants under 1 year of age and the exact age at which the infants are lost. Under the circumstances, it is difficult to calculate even the crude and conventional infant mortality rate, not to speak of any attempts at refining or standardizing it. The various methods of careful and minute refinement discussed in this chapter are, by and large, inapplicable in a country where even the mere total births and deaths are disputable. The inescapable conclusion is that steps should be taken as early as possible not only to ensure adequate vital registration but also to improve the quality of such vital statistics. Advanced and refined methods of demographic analysis may not be of great use when the basic data are inaccurate and unreliable.

<sup>1</sup> S. P. Jain, 'Birth Rates derived from Infants Enumerated', *Census of India, Paper No. 6, 1954* (New Delhi, Government of India Press, 1954), p. 50.

<sup>2</sup> Ibid., p. 50.

### CHAPTER III

## Infant Mortality in India and the World—Facts

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#### *The Facts*

A PERUSAL of the evolution of infant mortality trends during the last fifty years of this century among certain selected countries and territories of the world reveals, on the one hand, the phenomenal progress made in certain countries in ensuring infant health and welfare, and, on the other, India's unenviable position. The choice of some thirty-five areas listed in the table below (No. 7) is based on both the availability of sufficient statistical services to yield official infant mortality rates and a certain degree of representativeness of the world's population.

#### *Infant Mortality in Africa*

The native peoples of Africa with the exception of the Egyptians and the Europeans of South Africa constitute a serious omission. The infant mortality rates for most of the African peoples are not available for any long-time series to establish even rough trends. And such evidence as is available for small samples of population, the results of certain *ad hoc* studies in limited areas, reveal abnormally high rates — the mortality under one year ranging between one-half and one-third of all live births. (Apart from economic, social and cultural implications of such high infant mortality, the most serious is its effect on the mothers.)

'Infant mortality data are only available in a very limited number of territories, only for small limited areas', writes an African student of the problem. 'When it is further kept in mind that both registration areas for death and infant mortality are likely to change from year to year and that the population for the calculation of the death rate and the registration of births for the calculation of infant mortality rates are of poor quality, it will readily be understood that the study of mortality trends in African territories presents a very difficult problem indeed.'<sup>1</sup>

<sup>1</sup> Arne Barkhuus, 'Non-European Mortality and Infant Mortality in the Non-Self-Governing Territories in Africa south of the Sahara', paper presented at the U.N. World Conference on Population (Rome, 1954).

Despite these obvious limitations certain observations and limited studies give a rough range of infant mortality rates for some of the African territories. At the First International Conference on the African Child (1931) figures for infant mortality were given ranging from 100 to 500 and even up to 820.<sup>1</sup> According to Jelliffe: 'It is my guess that, as noted by Blackhock (*Ann. Trop. Med. Parasit.*, 31, 3, (1956)) the infant mortality rate is generally in the region of from 300 to 500 in most of Africa.'<sup>2</sup>

Amongst smaller sample studies may be mentioned Lestrangé, who found that 22.4 per cent of Coniagui children died in the first year of life while among the Bassari 44.4 per cent of the children died, presumably out of 100 live births.<sup>3</sup> Harding found that a community in Sierra Leone (population 1406) registered a birth rate of 32.9 and a death rate of 32.9 with an infant mortality rate of 417.<sup>4</sup>

Nhonoli gives some relatively reliable figures for a Christian group of the Nyamwezi tribe in Tanganyika for the decade 1941-50. This tribal group with a population of about a million registered infant mortality rates ranging from as low as 145 to as high as 462.<sup>5</sup>

Thus political observers, travellers, historians and more recently medical and social scientists have borne testimony to the effect that the infant mortality rates for African peoples range between 150 to 450 per 1000 live births during the last fifty years. The Registrar of Births and Deaths for the Gold Coast writes for the year 1927: 'The explanation is not hard to seek, namely, that whereas there has been a considerable improvement in sanitary conditions in the past ten years or more, the weak spot in the armour, the ante- and neonatal condition of the mother and infant still remains to be strengthened and this should include the health of the expectant mother, the conduct of the delivery and puerperium and the neonatal care of the infant.'<sup>6</sup>

Nhonoli, referred to above, points out: 'Until very recently there prevailed the most unhygienic practices at childbirth and neither the mother nor the attendant old woman knew even the rudiments of

<sup>1</sup> E. Sharp, *The African Child: An Account of the International Conference on African Children* (Geneva, Weardale Press, 1931).

<sup>2</sup> D. B. Jelliffe, 'The African Child', *Transactions of the Royal Society of Tropical Medicine and Hygiene* (London), January 1952, p. 30.

<sup>3</sup> Monique de Lestrangé, 'La Population de la Région de Youkounkoun en Guinée Française', *Population Studies*, Vol. 5, No. 4, 1950, pp. 643-68.

<sup>4</sup> R. D. Harding, 'A Note on Some Vital Statistics of a Primitive Peasant Community in Sierra Leone', *Population Studies*, Vol. 2, No. 3, 1948, pp. 373-7.

<sup>5</sup> A. M. M. Nhonoli, 'An Enquiry into the Infant Mortality Rate in Rural Areas of Unyamwezi', *East African Medical Journal*, Vol. 131, No. 1, 1954, pp. 1-12.

<sup>6</sup> Gold Coast. *Report on Births and Deaths* (1927), p. 6.

asepsis. The umbilical cord would be tied with any piece of cord or string picked up at the moment and the distal portion be sliced off with any old knife that came handy. . . . I have used the past tense throughout here, but the occasions when a more hygienic procedure is followed are still unfortunately few compared with what has just been described. No wonder that tetanus is common and that most, if not all, premature babies fail to survive.<sup>1</sup>

Professor Platt in a recent inquiry into the relation between food intake and infant mortality in West Africa obtained some very high rates of infant mortality. He points out: 'Babies born to poorly fed mothers are generally underweight and they often die in infancy or childhood. Infant mortality data for poorly fed communities are unreliable; there is nevertheless evidence that in tropical countries rates are from ten to a hundredfold higher than in this country (United Kingdom). I have recently assembled some figures obtained for several villages in the Gambia (West Africa).'<sup>2</sup>

TABLE NO 6. *Infant Mortality Rates in parts of Gambia, 1953*

Village	Rate per 1000 live births
1. Depressed village (Kerewan)	525
2. Group of Villages (trained nurses available)	207
3. Primitive village (Keneba)	462
Same village after the introduction of anti-malarial measures but with acute food shortage	351
4. Another village with adequate food supplies	166

TABLE NO 7. *The Evolution of Infant Mortality Rates from the Beginning of the Century to Mid-Century in Selected Countries*

Country	1901-1905	1906-1910	1911-1913	1921-1925	1926-1930	1931-1935	1936-1938	1946-1950	1951	1952
<i>Africa</i>										
Egypt	-	-	-	-	-	208	205	175	166	163
Mauritius	-	-	-	142	141	151	153	120	84	81
Union of S. Africa	-	-	91	73	67	63	56	36	34	35
(European pop. only)										

<sup>1</sup> A. M. M. Nhonoli, op. cit., p. 10.

<sup>2</sup> B. S. Platt, 'Food and Production' in A. Leslie Banks (ed.), *The Development of Tropical and Sub-Tropical Countries with particular reference to Africa* (London, Arnold, 1954), p. 107.



## INFANT MORTALITY IN INDIA

Country	1901- 1905	1906- 1910	1911- 1913	1921- 1925	1926- 1930	1931- 1935	1936- 1938	1946- 1950	1951	1952
<i>America</i>										
Canada (excluding Yukon & N.W. Territory)	-	-	-	98	93	75	68	44*	38	-
Chile	264	305	301	265	229	248	243	161	149	134
					(1928-38)					
Mexico	-	-	-	-	-	132	-	-	100	90
U.S.A. (white and non-white) †	-	-	-	74	68	59	54	32	28	29
Whites	-	-	-	71	64	54	50	30	-	-
Non-whites	-	-	-	112	104	90	83	48	-	-
<i>Asia</i>										
Ceylon	171	189	207	190	175	182	161	99	82	78
India (registration area)	-	-	206	182	177	173	163	131	116	-
Israel (prior 1948 Palestine)										
Jewish population	-	-	-	126	95	76	62	41	39	39
Moslems	-	-	-	191	193	166	148	-	-	-
					(1928-38)					
Japan	-	-	-	-	-	122	-	-	57	50
<i>Europe</i>										
Germany‡	199	174	164	122	94	74	63	71	53	48
Belgium	154	148	145	106	101	89	85	63	50	45
Denmark	119	108	98	82	82	71	64	38	29	29
Spain	-	-	-	149	131	118	124	77	68	-
Finland	131	117	112	96	88	72	67	52	35	32
France	-	-	-	-	94	78	71	62	51	46
Ireland	94	89	89	70	70	68	71	57	45	41
Iceland	101	119	72	53	53	51	36	24	26	-
Italy	167	155	141	127	119	105	105	77	67	-
Malta	-	-	-	270	278	277	219	108	100	72
Norway	80	69	65	52	49	45	40	31	26	-
Netherlands	136	114	105	70	56	45	38	31	25	23
United Kingdom										
England & Wales	138	117	111	76	68	62	56	36	30	27
Scotland	120	112	109	92	85	81	77	47	37	35
Sweden	91	78	71	60	58	50	44	24	21	20
Switzerland	134	115	104	65	54	48	45	36	30	29
Yugoslavia	-	-	-	-	151	153	139	117	140	125
<i>Oceania</i>										
Australia	97	79	71	57	52	41	39	27	25	24
New Zealand										
(excluding Maoris)	75	70	56	43	37	32	33	24	23	22
Maoris	-	-	-	-	108	98	118	76	68	84

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\* as from 1946 including Newfoundland.

† up to 1932 Birth Registration Area.

‡ as from 1956 Federal Republic of Germany.

TABLE NO 8. *Infant Mortality Rates in Selected Countries for 1901-05, 1947-51 and 1952*

Countries	1901-05	1947-51	1952
Australia	97	26	24
Belgium	148	61	35
Canada	—	44 (1946-50)	38
Ceylon	171	90	78
Chile	264	159	134
Denmark	119	34	29
Egypt (Cities)	—	139 (all Egypt)	163
England and Wales	138	35	27
Finland	131	47	32
France	139	62	41
Germany	199	64 (Western)	48
Iceland	101	—	—
India	215	116 (1951)	116
Ireland	94	52	41
Israel	—	40	39
Italy	167	72	64
Japan	—	64	72
Malta	—	—	81
Mauritius	—	—	23
Netherlands	136	28	24
New Zealand	75	23	—
Norway	80	31	39
Northern Ireland	108	—	94
Portugal	144	101 (1947-50)	94
Scotland	120	—	35
Spain	172	72	54
Sweden	91	22	20
Switzerland	134	34	29
United States of America	—	31	29
Yugoslavia	—	—	125

*Infant Mortality in Latin America*

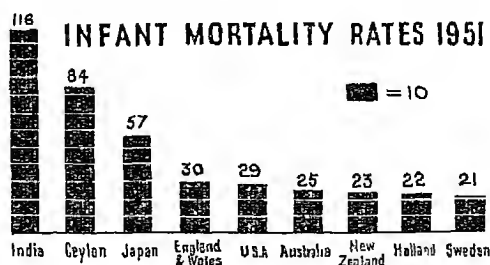
The position of many countries in Latin America is no better as far as reliable information is concerned. For many of these South American republics, infant mortality rates are available only for their capital cities and these only for recent years. If what is true of the capital cities is taken to be representative of the country as a whole (it is probable that infant mortality rates for the total population with poor health facilities, compared to capital cities with a certain amount of public health facilities, are bound to be higher) the infant mortality rate for the nation is unenviably high.

TABLE NO 9. *Infant Mortality Rates for Selected Countries for Certain Years Between 1900-52*

Year	India	Ceylon	Japan	U.S.A.	England and Wales	Aus- tralia	New Zealand	Hol- land	Swe- den
1900	232	178	151	—	154	104	71	153	94
1910	209	176	160	—	105	75	56	108	75
1920	195	182	168	—	80	66	48	50	65
1930	181	175	142	—	60	47	32	39	60
1940	160	149	124	—	57	38	30	39	39
1950	127	84	60	29	30	24	23	25	20
1951	116	—	57	29	30	25	23	25	21
1952	—	—	—	29	28	—	22	22	20

Latin America has yet to make effective gains in reducing her infant mortality rates. These countries, not unlike Asian countries, have yet to effectively organize and modernize their preventive and public health services and educate their women in mothercraft. Thus Latin America occupies a position between African territories on the one hand and Euro-Asian countries on the other.

The most privileged position has been attained by Western and North-Western European countries besides Australia and New Zealand. The present-day position (1955) of infant mortality rates in these advanced countries does not reveal any further development. They continue to maintain their advantageous position which they reached two or three decades ago. Though these most advanced countries appear to have reached the maximum possible success in cutting down their infant mortality, it is possible that these countries may yet register further advances reducing both reproductive and infantile wastage to the lowest possible point.

CHART NO 1. *Infant Mortality Rates in Selected Countries, 1951*

*World-wide Gains in Infant Mortality Reduction*

Africa and Latin America apart, the regions listed in Table No. 8 reveal that the reduction in infant mortality during the last fifty years and more has been world-wide. Though these areas belong to different stages of technical and socio-economic development they have on the whole been able to reduce infant mortality by 50 to 70 per cent between 1900 and 1952. In 1900, out of every 1000 children born alive, nearly 265 died before completing their first year in the least developed countries (among the 35 areas) and about 75 in the most favoured nations. By 1952, infant mortality had been reduced to 160 in the least developed countries and 25 in the most advanced countries. That is, during the last half a century, every country was able to effect some significant improvement; even those countries which started the century with relatively low infant mortality rates were able to effect further and sizeable reductions, revealing how much further progress in this direction is possible in the under-developed countries. While the degree of success in ensuring child health and the rate of reduction in infant mortality is still very uneven among these countries, the available figures demonstrate that the reduction has been uninterrupted in almost all the countries and there is practically no limit to the reduction in infant deaths under certain conditions. The day is probably not far off when almost every infant born alive can complete its first and most dangerous year of life without any serious difficulty. The necessary knowledge in the social and medical spheres is available today to achieve this end. But the major difficulty seems to be in bringing this knowledge to every parent in the world, particularly the mothers, and in removing the cultural barriers in the path of the acceptance of the available knowledge.

*International Comparison*

For purposes of an international comparison of the present-day levels of mortality, different regions of the world which do report on infant mortality, irrespective of the range of under-registration and other errors involved (in 1951 these areas had a total population of 787 millions out of an estimated total world population of some 2400 millions) can be divided into four major groups on the basis of information available for the years between 1901-52. They are:

1. *Low* — those areas with an infant mortality rate of 35 and below per 1000 live legitimate births.
2. *Moderate* — those areas with rates between 35 and 75.

3. *High* — those areas with rates between 75 and 125.

4. *Very high* — those areas with rates about 125.

The range of infant mortality rates according to these four divisions for selected countries during the last half a century is presented in the following table:

TABLE NO 10. *Infant Mortality Rates in Selected Countries, 1901-05, 1947-51, 1951, 1952, 1953 and 1954*<sup>1</sup>

Present Stage	Infant Mortality Index	Country	Infant Mortality Rates					
			1901-1905	1947-1951	1951	1952	1953	1954
<i>Low</i>	35 and below	Sweden	91	22	21	20	19	19
		Holland	136	28	25	22	—	—
		New Zealand	75	23	23	22	24	24
		Australia	97	26	25	24	23	23
		England and Wales	138	35	30	28	—	—
		Norway	80	31	26	24	21	—
		Denmark	119	34	29	29	—	—
		Switzerland	134	34	30	29	—	—
		U.S.A. (1921-25)	74	31	29	29	—	—
		Finland	131	47	35	32	—	—
<i>Moderate</i>	between 35 and 75	Belgium	148	61	58	35	—	—
		Scotland	120	—	37	35	—	—
		Canada (1921-25)	98	44	38	38	—	—
		Ireland	94	52	45	41	—	—
		France	139	62	51	45	—	—
		Germany (F.R.)	199	64	53	48	—	—
		Japan	—	64	51	50	—	—
		Italy	167	72	67	64	—	—
		Spain	172	72	70	54	—	—
<i>High</i>	between 75 and 125	Ceylon	171	90	82	78	—	—
		Portugal	144	101	89	95	—	—
		India	215	(1947-50) 128	116	—	—	—
		Mexico	132	—	100	90	—	—
			(1928-38)					
		Brazil	—	—	107	—	—	—
<i>Very high</i>	Above 125	Chile	264	159	149	134	—	—
		Egypt*	—	139	166	163	—	—

<sup>1</sup> Sources: *Demographic Year Book* (United Nations, New York, 1952). *Epidemiological and Vital Statistics Report* (World Health Organization, Geneva, 1954), Vol. VII, No. 1.

\* Section of the country having Health Bureaux.

This apparently arbitrary division in Table No 10 proves rather instructive when the infant mortality rates for several countries belonging to these four stages between 1901-05 and 1947-52 are examined.

England and Wales, Holland and Switzerland, which were once in the 'very high' stage have advanced to the 'low' stage involving considerable reduction in the rate of infant mortality in the last fifty years. But countries such as Australia, New Zealand, Sweden and Norway, which began their demographic histories fifty years ago with relatively low rates, have not registered comparable rates of progress, for possibly the factors that contribute directly to a reduction in infant mortality were brought under control some decades ago. Scotland, Canada, France, Germany, Italy and Spain, which began this century with high rates of infant mortality, have shown no spectacular decline comparable to those countries which are today in the 'low' stage despite their more or less identical European economies and cultural backgrounds.

The table also reveals India's unenviable position among the major countries in the world and even among the Asian countries. The only Asian country found in the 'moderate' stage today is Japan. Though reliable figures of her position in the first few years of this century are not available, they must have been high and therefore Japan's progress in this direction has been commendable. The two other Asian countries which are making rapid strides for the better are Ceylon and India, Ceylon's rate being much lower than that of India in 1900 as well as in 1951.

It is also noteworthy that the countries with the lowest infant mortality rates are the advanced and industrialized Western European ones and those with European patterns and levels of living such as Australia, Canada, New Zealand and the United States of America. This distinction is not so much racial or biological as cultural and economic. The reasons for the decline in infant mortality in these areas will be discussed in some detail later, but it is obvious that these are the countries which have more or less low or stabilized birth rates and where babies cannot be had at bargain prices. This is true despite periodical spurts in the birth rates, as fashions in family size change, as for example in contemporary United States of America.

The successful and widespread practice of contraception has led to smaller families with the consequence that a greater premium is put on the life of a baby. It is true that when more infants are born more infants will die (Holland with a high birth rate and a low infant mortality rate is a notable exception) though it is possible that more infants will survive. It is also clear that the low rates are

related to the higher economic levels that these communities have attained. This relation becomes apparent when under-privileged economic groups in the same population or different ethnic groups in the same country register different rates of infant mortality. This is revealed when *per capita* national income figures and infant mortality rates of various countries and groups within countries are compared. Economic privilege is no doubt a significant factor in effecting a sizeable decline in infant mortality among different human groups when other factors remain more or less the same.

Perhaps more important than even the economic factor is the cultural one involving a scale of values in life which places a considerable premium on quality and not on quantity. The magnificent accomplishment of the Scandinavian countries, for instance, in cutting down their infant mortality rates to the present lowest possible rates, reveals 'the wisdom of transferring part of the vital energy that women formerly exhausted (and continue to exhaust in many parts of the world) in the biological process of bearing children to the proper care and feeding of the smaller number of babies which the average woman now brings into the world. Of course, there would be no room for optimism on this point if the advocates of natural selection could point to vigorous races and physical specimens produced in the parts of the world such as India, China or Egypt where infant mortality and other selective forces have held almost unbridled sway'.<sup>1</sup>

### *Infant Mortality in India*

The difficulties in evaluating the deficiencies inherent in Indian vital statistics have already been examined in some detail. Here, for reasons already discussed, the figures and the official rates given by the provincial and central governments are accepted such as they are to reveal reasonable dimensions and trends. Table No 11 gives the infant mortality rates in India between 1901-51.

Table No 12 gives most of the available details of infant mortality in the former British provinces between 1920-39. Table No 13 presents infant mortality as a percentage of total mortality in all ages in the provinces between 1920-42.

Table No 11, which gives the course of infant mortality in India from 1900 to the latest available year, deserves a serious examination. It gives the official infant mortality for the provinces of British India and in recent years for the area of the Republic of India in annual rates and in quinquennial averages.

<sup>1</sup> Lynn Smith, *Population Analysis* (New York, McGraw Hill, 1948), p. 265.

TABLE NO 11. *Infant Mortality Rates in India, 1901-51 (a) (Deaths of Infants Under One Year per 1000 Live Births and Quinquennial Averages for Registration Area in India)*

Year	Rate	Five-Year average	Year	Rate	Five-Year average
1900	232		1926	189	
1901	200		1927	167	
1902	209		1928	173	178
1903	227	215	1929	178	
1904	204		1930	181	
1905	226				
1906	225		1931	179	
1907	216		1932	169	
1908	246	228	1933	171	174
1909	202		1934	187	
1910	200		1935	164	
1911	205		1936	162	
1912	208		1937	162	
1913	195	204	1938	167	161
1914	212		1939	156	
1915	202		1940	160	
1916	202		1941	158	
1917	205		1942	163	
1918	267	219	1943	165	161
1919	224		1944	169	
1920	195		1945	151	
1921	198		1946 (b)	136 (c)	
1922	175		1947 (d)	146	
1923	176	174	1948 (e)	130	134
1924	189		1949	123	
1925	174		1950	127	
			1951	124	
			1952	116	
			1953	119	

- (a) It is possible that comparability of these annual rates may be adversely affected by different degrees of reliability of the population figures used in the calculation of these mortality rates. Secondly, there is the question of the validity of comparing the three parts of the time series—the period before 1921 relating to a scattered and growing area, the period 1921-46 relating to the former provinces of British India, and the period since 1947 relating to the registration area of the Indian Republic, that is, British provinces minus Pakistan and plus Native States.
- (b) Until 1946 the registration area comprised the British Provinces in undivided India excluding the Native States.
- (c) Excluding East Bengal for which area figures are not available.
- (d) Partition of the country into India and Pakistan.
- (e) For 1948 and subsequent years the figures are for the States (Provinces) of the Indian Union as reconstituted after partition.
- Registration throughout is officially stated to be incomplete. This is also true of the present States of the Indian Union.



TABLE NO 12. *Some Details of Infant Mortality in India (British India), 1920-39<sup>1</sup>**Neo-Natal Mortality, Mortality for 1-6 months, 6-12 months and Respective Ratios for 1000 Live Births*

Year	Under 1 month per cent of total Infant Mortality	Ratio per 1000 live births	1-6 months per cent of total Infant Mortality	Ratio per 1000 live births	6-12 months per cent of total Infant Mortality	Ratio per 1000 live births
1920	32.7	86	29.6	43	37.6	-
1921	44.2	87	29.2	58	26.6	55
1922	48.8	85	28.3	50	22.9	40
1923	49.5	87	28.2	49	22.3	39
1924	48.1	91	28.9	55	22.9	43
1925	49.6	86	28.2	49	22.2	39
1926	47.2	89	29.9	56	22.9	43
1927	49.5	83	28.5	48	21.9	36
1928	48.4	84	29.4	51	22.2	38
1929	47.4	84	29.4	52	23.2	41
1930	48.8	87	29.6	53	22.6	41
1931	48.1	86	29.0	52	23.0	41
1932	49.0	83	29.0	48	23.0	38
1933	48.0	82	29.0	50	23.0	39
1934	45.0	84	31.0	58	24.0	45
1935	47.0	77	30.0	49	23.0	38
1936	47.3	77	31.2	35	21.5	35
1937	48.4	78	29.3	48	22.3	36
1938	46.8	78	30.6	51	22.6	38
1939	47.3	74	30.3	47	22.4	35

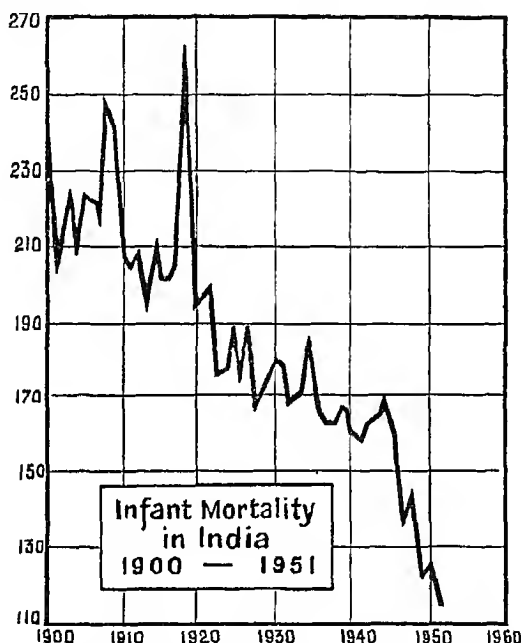
How far are these figures correct? As pointed out already, the registration of both births and deaths is incomplete and defective, but it is probable that the registration of births is less reliable than that of deaths. As to the reliability of the entire record, there are the following three possibilities: some births are not registered; some infant deaths are not registered; when deaths are registered the recorded age of the deceased infant may be inaccurate.

This situation can be dealt with in many ways: the registration figures may be adjusted on the basis of the various decennial census figures, a procedure which presupposes their (Census's) absolute reliability, whereas it is known that they are not exact and there is always the problem of under-enumeration. Secondly, the magnitude of under-registration can be estimated on the basis of a sample study

<sup>1</sup> Classification of Infant Deaths by age in months is not available for years before 1920, and these returns were discontinued from the beginning of the Second World War in 1939.

and the margin of error be taken as uniformly applicable to the entire area. Such sample studies should have been made for every year and for every region to check the annual vital statistics rates and for every ten years to check the decennial census figures, but such corrections as these are not available. According to the Population

CHART NO 2. *Decline of Infant Mortality rate in India, 1900-51*



Data Enquiry Committee Report, the magnitude of under-registration is estimated to be about 50 per cent but this is nothing more than a reasoned conjecture when considering so long a period as half a century.<sup>1</sup> In general, and theoretically, birth registration is less complete than death registration for obvious reasons. This is particularly true in countries where burial is the rule and a permit for burial is issued only after registration of death, but not so in India, where the practice of quick cremation, due to climatic reasons, for an overwhelming majority of the population is widespread.

And when deaths are registered one is not sure of the exact age of

<sup>1</sup> *Report of the Population Data Committee* (Simla, Government of India Press, 1945), p. 6.

the deceased. One might expect this error to be very minor in the case of infants, for a lapse of memory on the part of parents or relatives or the recorders could not arise in such a short time, but in practice the error is significant. A study of urban mortality statistics reveals that the information which is given about the age of the child when reporting the death is usually vague with the result that many deaths over one year of age are returned as under one year, thus swelling the infant mortality rate. The reverse of this situation — declaring a deceased infant of less than one year to be older does not often arise. In view of these considerations, the official figures are examined here as such without any attempt at correction or refinement. If we do not set much store by the actual figures and are guided only by the trends revealed in a period stretching over fifty years, we need not be misled by the obvious inaccuracies referred to above.

Both the tabular material and the graph show that (a) the infant mortality rates throughout the period have been abnormally high in relation to rates in certain selected and of course advanced countries in Asia and the West, being four times as high as those of Sweden and New Zealand; (b) there have been three peak years (1900, 1908-09 and 1918) when the rates have been inordinately high; and (c) a declining trend is noticeable since the 1930s.

(a) During the last fifty years the infant mortality rates range from 116 per 1000 live births in 1951 to 267 in 1918; the fluctuations have thus an enormous range. A comparison of the Indian rates with those of Japan and Ceylon in Asia, England and Wales, Sweden and Holland in Europe, the U.S.A., Australia and New Zealand even during the earlier years of this century, shows the difficult start India has had in the matter. She clearly began with a great handicap, for her public health and hygiene measures were (and unfortunately are) in no way comparable to those existing in these countries with the possible exception of Japan. The causes for this excessive mortality, into which we shall inquire in some detail later, must be sought in the social, economic, cultural, religious and health background in India. The diseases and the pathological causes to which these infants apparently succumb are discussed below in the light of the available official information.

(b) Secondly, there are three peak years, 1900, 1908-09 and 1918, when the infant mortality rates (and mortality rates at all ages) have been very high. Apart from what may be termed 'ordinary causes' from the Indian point of view the high rate in 1900 was due to famine in the country as a whole with defective and mal-nutrition leading to epidemics and heavy loss of life. The year 1908 was also a bad one, due to a severe malaria epidemic over the whole of Northern

India. While malaria is not always lethal in the case of an otherwise 'healthy' and normal adult, it often proves fatal to an infant.

The highest peak in infant mortality, in 1918, was caused by the world-wide influenza epidemic of that year which claimed in India some 12 to 15 million people of all ages.

Despite these peaks and variations a declining trend is noticeable since the 1930s. The infant mortality rate has been on the decline since 1935 except for a slight rise in 1944 due to the severe famine in Bengal in 1943-44 which took an estimated toll of about 3 million (official figure 1.5 million) people of all ages. The infant mortality rate has been exactly halved in the course of half a century from 232 in 1900 to 116 in 1951. The rate in England and Wales was reduced from 154 in 1900 to 30 in 1951. What England and Wales took twenty years to accomplish between 1900 and 1920, India took fifty years to achieve. In the United States of America, which is perhaps more comparable to India in area and a heterogeneous population, the infant mortality rate was reduced by half in about thirty years from 99.9 in 1915 to 39.4 in 1944 and it was 122 in 1900 compared to 29 in 1950. While the rate of decline in India during the period in question has not been impressive in comparison with that in certain other countries, the decline has begun and if the present plans for health improvement as a part of the First and Second Five Year Plans for raising the standard of living are carried out, further reductions are bound to take place.

### *Neonatal Mortality in India*

As for neonatal mortality, figures are not available for the period under review. But such limited data as are available are presented in Table No 12. They show that neonatal mortality in India for the twenty years 1920-39 ranges between 32 and 49 per cent of total infant mortality. In fact, except for one year, the mean ratio has been around 47 per cent. That is, nearly 50 per cent of infant mortality in any year takes place in the first month of the infant's life. In Western countries, the marked decline in infant mortality in recent decades has taken place in the post-neonatal period covering the second to the twelfth month, while the first month has shown only slight improvement. This is also probably true of India except that we do not have figures for the last ten years to demonstrate clearly at what age the real decline in infant mortality has set in.

On the other hand, a more basic question may be asked. The declining trend in infant mortality evidenced in the official figures may not be real at all! Since 1942 there has been a national, quasi-

chronic food shortage, acute regional shortages of food which though not always as intense as the Bengal famine of 1943, are often near the famine level, a lack of housing made worse by the influx of refugees as a result of the partition and its aftermath, and a considerable rise in the cost of living. As a result of these conditions, morbidity and mortality in the vulnerable groups of the country's population must, if anything, be on the increase. Here again there is no indisputable evidence. Is then, the decline in infant mortality rates noted in Table No 11 real or imaginary? An answer to this question is important, for if the decline is real, then the implications of such a decline, as already pointed out, need to be explored. If, however, the decline is illusory, the inferential attitude of complacency on the part of the authorities should be given up and vigorous efforts made to effect such a decline.

TABLE NO 13. *Infant Mortality as Percentage of Total Mortality at all Ages in India (British India), 1920-42*

Year	Percentage	Year	Percentage
1920	23.8	1932	26.2
1921	23.2	1933	27.0
1922	23.2	1934	26.4
1923	24.6	1935	25.6
1924	22.8	1936	24.1
1925	23.7	1937	24.8
1926	24.6	1938	23.4
1927	23.7	1939	23.6
1928	25.0	1940	24.2
1929	24.0	1941	23.2
1930	24.0	1942	22.4
1931	24.7		

Furthermore, the fact that the recorded rate of infant mortality has not risen in spite of improved registration should not be lost sight of. The decline is marked in some provinces and it is striking in the composite State of Madras where the Director of Public Health, in his Annual Report for 1948 points out that the decline is real: 'The steady decline in infantile mortality in recent years in spite of the difficult food situation is due to improvement in environmental hygiene, expansion of maternal and child welfare services, health education and raising the age of marriage.'<sup>1</sup>

In the face of the only available evidence, it must be assumed that some decline in infant mortality as revealed in the official figures, must be taken to be nearer the truth. Four recent inquiries have yielded figures which though high when compared with those of Western

<sup>1</sup> *Annual Report of the Director of Public Health, Madras, 1948* (Madras, Government Press, 1950), p. 9.

countries are low in comparison with earlier or contemporary official Indian figures.

### *Singhur (1943)*

The first survey is that of the All-India Institute of Public Health and Hygiene in Calcutta which conducted in 1943 a general health survey of Singhur — a nearby rural area involving some 300 families and 307 live births. The Survey yielded an infant mortality rate of about 137. The Report points out: 'The sex specific infant mortality being 196 and 85 for males and females respectively, the former are again at a considerable disadvantage. The special reasons for higher rates amongst the former may also help to indicate lines along which endeavours could be made to reduce waste in early life. From the analysis of the causes of death so far carried out, it would appear that a multiplicity of causes are in operation but there are some indications of difficult labour as being one of the possible causes of infant mortality amongst the males.'

### *National Sample Survey (1952)*

The national sample survey, covering roughly about 1000 villages, fifty towns and four cities, was set up in 1951 under the auspices of the Ministry of Finance of the Government of India and the Indian Statistical Institute at Calcutta. The second round of the national sample survey based on a sample of all-India *rural* households covering 1106 villages taken in 1952 yielded the infant mortality rates set out in Table No 14.

TABLE NO 14. *India: National Sample Survey: Infant Mortality Rates (1952)*

Period of Marriage	No. of Couples	No. of Infant Deaths per 1000 Births
Before 1910	2177	88
1910-19	2415	102
1920-29	3612	126
1930-39	4652	134
1940-45	3306	133
1946-51	3714	181

The figures for infant mortality rates given in the last column of the above table must be taken with considerable reserve and caution.

The national sample survey is conducted by the interview method, and the limitations of such a method, in Indian conditions where the person interviewed is under no obligation to answer, much less to the best of his or her ability or memory, are obvious. It is also possible that no serious distinction was made between still births and live births. The figures in the last column point to the lapse of memory of couples about the deaths of their infants, increasing with the interval of time. This may be astonishing but in villages the loss of an adult member is probably better remembered than the loss of an infant. There is also the further disadvantage of confusion over the age of the deceased infant. The death of a fifteen-month-old infant may be recalled as under one year. The last figure in the last column, the infant mortality rate of 181 per 1000 births (presumably live) for the period of 1946-51 for rural India, is perhaps the only figure that merits some attention. These results are cited here only to show the approximate range of infant mortality rates in the last five years. The mean average of official figures for the same five years yields the rate of 134 per 1000 live births.

### *Mysore Survey (1952)*

A general population survey of a sample of rural and urban families for the state of Mysore conducted in 1952 under the joint auspices of the Government of India and the United Nations yielded (according to a provisional announcement) an infant mortality rate of 168.1 per 1000 live births for rural (plains) and 100.9 for towns. This survey also revealed that infant mortality rates decreased with a rise in economic status. This, in the sense of a real increase in income, was reflected in better housing and in better domestic amenities (an elementary index adopted was the kind of lighting used, electricity, kerosene, etc.). The infant mortality rate for families in poor-class housing in urban areas was 100 per 1000 live births but the rate dropped to 60 when housing conditions improved. In the rural areas the agricultural labour families had an infant mortality rate of 189 per 1000 live births while the owner-cultivator families with better incomes had a rate of only 113.

### *Poonamallee Survey (1953)*

The object of this inquiry which was of a pilot nature was to assess the true infant mortality rate and the causes of such mortality in a rural area in Madras State. The plan involved following a cohort of births for a year in their own homes and ascertaining the causes

of infant mortality by the inquiry method. (It may be recalled that rural births and deaths are registered by village headmen who are not medical men, and what is worse there is no medical certification of death.) This method is not one hundred per cent correct but due to financial reasons and the want of laboratory facilities for performing autopsies and skilled medical personnel this method was adopted. The maternal and child health staff visited the infants periodically and made inquiries and recorded infant health conditions. When an infant died, the Woman Medical Officer and the Health Visitor visited the party and on the basis of an intensive personal inquiry and examination of health conditions already recorded at the previous visits, the cause of death was finally determined by the Woman Medical Officer. No autopsy was carried out.

The inquiry was confined to infants born in the Poonamallee area between August 15th, 1951, to August 14th, 1952. The inquiry was completed on August 14th, 1953, to complete one year of life for the latest baby born in the cohort.

The total number of expectant mothers who came under observation was 1555. These women gave birth to 1563 infants (838 males and 725 females) and included 8 twins. Of these, 1506 were live births (807 males and 699 females) and 57 were stillbirths (31 males and 26 females). The number of infants who formed the cohort for observation was therefore 1506. Of these, 186 infants were known to have died. Some infants moved out of the area and were thus lost for observation.

The inquiry yielded the following results: the infant mortality rates for the period under inquiry, August 1951 to August 1952, ranged between 137.59 and 347.84 per 1000 live births. The true infant mortality rate was found to be 140.73 per 1000 live births. The infant mortality rates in the age groups under one year were as follows:

under 1 month	45.70 per 1000 live births
1 to 6 months	63.40 per 1000 live births
6 to 12 months	31.63 per 1000 live births
Infant mortality rate	<u>140.73</u>

(1) As for the causes of this infant mortality, intestinal intoxication was the leading cause and accounted for 42 (22.6 per cent) infant deaths, 32 of those deaths (70 per cent) occurred between 3 and 12 months.

(2) Asphyxia was the next cause which claimed 26 infant deaths (14 per cent). Of these 26 infants, 21 died within the first month of life.



(3) The third important cause was prematurity, which was responsible for 23 deaths (12.4 per cent). Most of the deaths arising out of this cause occurred in the neonatal period.

(4) Bronchitis, pyogenic infection (skin) and nutritional maladjustments caused 14, 13 and 10 infant deaths, representing 7.5, 7.0 and 5.4 per cent of total infant deaths respectively.

(5) Out of 66 neonatal deaths, 21 were caused by asphyxia and 16 by prematurity.

(6) In only 3 cases of infant deaths (1.6 per cent) the causes of deaths could not be decided.

This survey, carried out under the guidance of Dr. Mabel Sharma, Deputy Director of Public Health of the Government of Madras, is the latest and the most detailed. Though the inquiry was limited to a restricted rural area and could not be very scientific from the medical point of view, for reasons already explained, this gives a more or less true rate of infant mortality for the period in a well-defined area of the Indian Union.

### *Infant Mortality Rates in Different Communities*

For certain years and for some provinces and cities, infant mortality rates have been recorded according to communities based on caste and religion: Christians, Hindus and Muslims. An examination of these rates for the provinces of British India up to 1939 reveals a very low rate for Indian Christians, high for Muslims and highest for Hindus. This order is maintained almost uniformly in seven provinces for ten years prior to the beginning of the Second World War. The Indian Christian group form a small minority of the total population (see Appendix II for the religious composition of the Indian population) and while most of them belong either to the lower middle or low income groups they are educationally more advanced than the Hindus. Their fertility pattern, however, is not significantly different from that of the Hindus and Muslims. Their low infant mortality rates can only be explained by their better knowledge of child care and a higher percentage of educated women, and above all, their readiness to adopt, whenever economic factors permit, certain features of what is called the European way of life in India.

Even more interesting are the figures for Bombay City where infant mortality rates by communities show what reduction is possible under certain conditions. Bombay City is international in its population composition but the communities for which comparable figures are available are the Hindus (both the scheduled, that is

backward, and the so-called high castes), Muslims, Indian Christians, Parsees and Europeans. While vital statistics in the City of Bombay are probably one of the most reliable series available, those for the Parsees are even more so, especially their mortality statistics, in view of their particular method of disposing of the dead (in the Tower of Silence) which necessitates full and unavoidable registration. The following Table No 15 gives the comparative rates for recent years.

TABLE NO 15. *Infant Mortality Rates by Communities in Bombay City, 1938-47*

Period	Hindus (scheduled castes)	Hindus (other castes)	Muslims	Indian Christians	Parsees	Euro- peans
1938-39	332	272	247	236	111	174
1939-40	257	217	182	197	100	68
1940-41	232	209	187	169	95	39
1942-43	245	196	179	190	92	55
1943-44	261	193	181	193	84	53
1944-45	253	204	199	189	68	47
1945-46	286	186	166	164	80	26
1946-47	308	185	189	179	72	37

These rates are instructive, for the communal differentials in the infant mortality rates may be taken to be *roughly* comparable to the United Kingdom Registrar-General's five-fold social classification.<sup>1</sup> While all these communities, with the exception of the Europeans, are ethnically Indian, each has its own *milieu* easily distinguishable from the others. Socio-cultural patterns of living involving age-old habits, customs and traditions, affecting cleanliness, eating, clothing, child-care and almost every detail of daily living are conditioned by the communal *mores*.

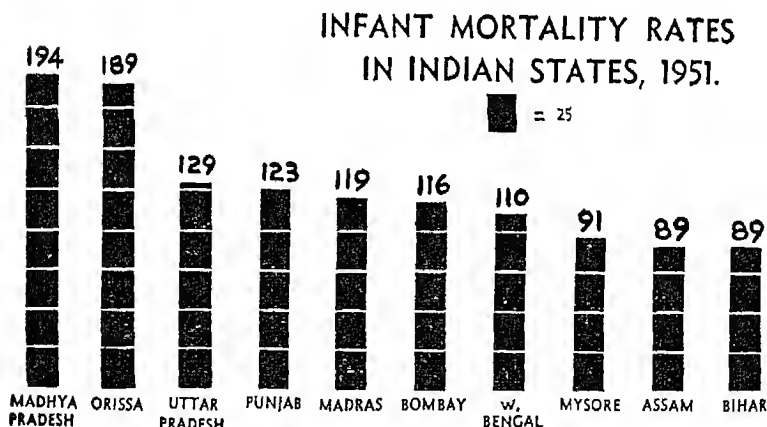
These figures demonstrate how two Indian communities — the Hindus and the Parsees — living in the same city, can have such divergent infant mortality rates. The Hindus, who form an overwhelming majority of the population, have a rate of about 300, while the Parsees, who constitute the smallest minority, have a rate of about 70 per 1000 live births. The Indian Christians, whose infant mortality rates in the provinces are much lower than those of the

<sup>1</sup> The Registrar General for the United Kingdom classifies the population into five social classes on the basis of occupation as follows: I class — middle classes, e.g. scientists, physicians, professors, etc.; II class — intermediate class, e.g. farmers and farm managers, money-lenders, etc.; III class — skilled, e.g. foremen, watchmakers, nurses, etc.; IV class — semi-skilled, e.g. fishermen and hawkers, etc., and V class — unskilled, e.g. manual labourers, porters, etc.

Hindus, have higher rates in Bombay City. This is probably the result of the heavy incursion of Catholics from Goa, most of whom belong to low educational and income groups and consequently are a high fertility group. The Parsees constitute an educated, advanced and relatively well-to-do group with more or less a Western way of life. While a majority of the Parsees live in relative ease and enlightenment they do not live in a geographical or social vacuum, for their infants are more or less exposed to the same environmental hazards as the infants of other communities. The real explanation here is probably one of income differentials as reflected in the different areas of residence, for Bombay has its Park Avenues as well as its East Ends, and also the high percentage of educated mothers among the Parsees who know how to care for children in the sense of mother-craft.

The pattern of evolution of Parsee infant mortality during the last five decades is closer to certain European countries than to any Indian community. Table No 16 presents the population numbers and the infant mortality rates of the Parsees for the last six decennial years.

CHART NO 3. *Infant Mortality Rates in Indian States, 1951*



In the first quarter of the twentieth century the Parsee infant mortality rate was between 150 and 200 and in some years exceeded 200. In the next ten years the rate came down to about 100. Since 1945 the rate has declined considerably and today it is about 50. The present Parsee rate is far below those registered for other Indian communities.

TABLE NO 16. *India: Total Parsee Population and their Infant Mortality Rates at Census Years*

Year	Population	Infant Mortality Rate
1901	93,617	219
1911	99,412	186
1921	101,075	245
1931	108,988	118
1941	114,890	72
1951	111,791 (Indian Union)	51

The Parsees, who constitute only 0.03 per cent of the total Indian population, are predominantly urban, and more than half of them live in Bombay City. The rest are distributed all over India, but most of them live in the State of Bombay. It should be possible for other communities to reach this low mortality record, given relatively high levels of income and education.

### *Some Conclusions*

The international data summarized in the preceding tables reveal that the variations in infant mortality rates are very great. They range from 20 to 500, all the way from Australia-New Zealand to parts of Africa. They vary from country to country, class to class and community to community. What is more, they vary between various ethnic, religious and cultural groups within the same country and also between rural and urban areas and between different income and educational groups.

As for India, certain obvious conclusions emerge from the limited available data and this necessarily incomplete analysis. The infant mortality rate and its component parts are high in contrast to the position in several advanced countries. But during the last few years, the trend of the rate is one of definite decline, despite an almost chronic food shortage, occasional epidemics and the all too visible low level of living of the Indian people. This marked decline in the infant mortality rate is real and not illusory.

During the last few years India's birth rate has been around 40 per 1000. That is, every year about fifteen million babies are born, and among them nearly two million infants are the offspring of parents who have already given birth to three or more children. At the same time, about ten million people of all ages die every year. Among these nearly two million deaths are of infants under the age

TABLE NO 17. *Infant Mortality Rates for Indian Provinces and States, 1925-55*

Year	Assam	Bihar	Bombay	Madhya Pradesh	Madras	Orissa	Punjab	Uttar Pradesh	West Bengal	Mysore
1925	174	138	162	204	181		188	176	179	128
1926	182	148	195	253	190		234	177	197	110
1927	171	133	161	222	175		168	152	178	106
1928	172	132	180	238	184		168	160	178	121
1929	157	135	189	240	180		186	169	180	113
1930	174	138	187	242	186		186	171	187	117
1931	153	144	162	261	187		178	179	174	102
1932	157	129	156	201	183		179	163	179	119
1933	163	135	161	200	185		193	138	200	124
1934	165	150	167	253	199		187	185	189	151
1935	163	129	164	224	179		155	157	159	144
1936	151	118	166	235	164	199	158	149	171	145
1937	160	116	161	219	170	215	163	142	176	132
1938	165	120	174	238	166	222	167	149	185	133
1939	150	113	153	219	176	197	168	140	147	136
1940	142	118	170	226	169	183	178	135	159	146
1941	136	109	159	215	171	225	185	131	156	126
1942	137	106	161	232	160	191	214	143	154	123
1943	131	99	157	206	172	203	190	135	195	142
1944	162	111	166	221	193	207	173	125	208	130
1945	131	100	161	257	169	178	145	123	143	101
1946	113	90	163	203	147	171	133	111	143†	91
1947	91	83	162	243	147	201	154*	117	145	108
1948	103	80	141	210	128	175	130	109	137	70
1949	96	76	141	186	120	176	132	95	133	82
1950	101	80	127	196	130	158	160	104	126	93
1951	89	89	116	194	119	189	123	129	110	87
1952	83	69	116	168	108	159	127	129	100	91
1953	—	71	118	169	114	153	133	122	94	98
1954	76	78	116	150	101	133	113	110	87	—
1955	85	—	100	—	103	—	106	99	79	—

\* From 1947 and onwards relates to Punjab as constituted after partition.

† From 1946 and onwards relates to West Bengal.

of one. That is, every year about 120 infants out of 1000 live births die before they complete their first year.

The total infant mortality in India constitutes about a fifth of total mortality of all ages in a year. The rate was a fourth a few years ago but it has improved. And if the present measures to combat infant deaths are intensified, the rate is bound to come down further within a decade.

Of the total infant deaths, nearly half (between 45 and 48 per cent)

TABLE NO 18. *Infant Mortality Rates for India by Sex (former Provinces and Present Registration Area), 1900-55*

Year	Male	Female	Year	Male	Female
1900	—	—	1928	151	164
1901	—	—	1929	185	169
1902	—	—	1930	189	172
1903	—	—	1931	187	170
1904	—	—	1932	177	160
1905	231	218	1933	177	163
1906	228	218	1934	195	178
1907	222	209	1935	171	176
1908	250	241	1936	171	153
1909	261	227	1937	170	153
1910	217	201	1938	176	158
1911	214	196	1939	163	147
1912	216	199	1940	—	—
1913	193	197	1941	—	—
1914	219	204	1942	170	156
1915	208	195	1943	175	162
1916	209	195	1944	175	164
1917	212	198	1945	—	—
1918	274	260	1946	—	—
1919	228	220	1947	—	—
1920	210	188	1948	152	140
1921	205	190	1949	128	117
1922	183	166	1950	132	122
1923	183	168	1951	129	120
1924	197	180	1952	120	112
1925	181	167	1953	—	—
1926	197	180	1954	—	—
1927	174	159	1955	—	—

TABLE NO 19. *Infant Mortality Rates for Rural and Urban Areas in India (former Provinces and Present Registration Area of the Indian Union), 1932-55. (Figures for 1900-31 not available)*

Year	Rural	Urban	Year	Rural	Urban
1932	167	189	1944	164	214
1933	164	210	1945	148	177
1934	183	218	1946	133	163
1935	158	213	1947*	141	169
1936	157	212	1948	126	152
1937	157	211	1949	119	139
1938	164	191	1950	124	140
1939	151	199	1951	122	124
1940	155	202	1952	114	122
1941	153	201	1953	118	119
1942	158	204	1954	113	120
1943	159	212	1955	—	—

\* Figures from 1947 onwards relate to all the Part 'A' States and Delhi, Ajmer and Coorg as constituted after partition.

TABLE NO 20. *Infant Mortality Rates in Major Indian Cities, 1925-55*

Year	Ahmed- abad	Allah- abad	Ba- roda	Bom- bay	Cal- cutta	Del- hi	Luck- now	Mad- ras	Nag- pur	Pat- na	Poo- na	Su- rat
1925	323	236	248	359	326	183	260	279	258	-	611	330
1926	438	244	313	255	372	238	287	282	302	287	733	453
1927	287	230	223	316	340	201	256	240	254	-	574	325
1928	331	234	293	314	276	210	301	289	299	-	553	349
1929	332	259	239	301	259	259	269	259	291	-	343	364
1930	356	263	224	298	268	199	329	246	270	-	351	370
1931	301	256	240	274	244	202	266	251	323	-	367	323
1932	293	222	218	219	246	201	266	239	244	-	332	269
1933	275	212	180	270	275	233	264	268	248	-	361	294
1934	316	252	230	246	259	219	275	232	296	-	334	291
1935	280	194	-	248	239	196	224	227	261	-	320	272
1936	303	204	216	250	242	170	224	218	284	-	297	308
1937	280	226	204	246	253	-	224	224	235	-	344	272
1938	283	196	182	268	219	156	226	222	264	-	269	268
1939	267	188	217	212	205	170	212	242	226	-	230	247
1940	310	231	-	202	213	174	214	206	295	126	329	262
1941	248	195	183	211	208	186	191	209	227	65	321	242
1942	293	210	190	95	167	177	210	197	276	84	315	240
1943	264	203	185	197	428	196	189	247	202	199	-	229
1944	278	218	189	203	430	186	175	284	228	149	331	261
1945	187	191	196	190	289	154	205	214	275	115	320	308
1946	236	143	149	195	243	147	165	183	194	106	332	267
1947	240	157	130	167	269	178	189	196	287	88	252	201
1948	203	174	143	166	259	116	155	157	306	197	210	168
1949	245	142	-	174	-	108	143	159	216	131	220	183
1950	190	117	97	144	185	103	160	188	227	253	186	176
1951	169	99	97	94	203	92	133	167	239	-	154	156
1952	184	145	104	133	183	90	152	164	158	137	150	191
1953	162	102	90	134	161	95	128	180	227	-	165	150
1954	-	106	79	124	137	-	124	136	193	-	156	152
1955	-	86	85	111	133	-	116	143	-	-	123	145

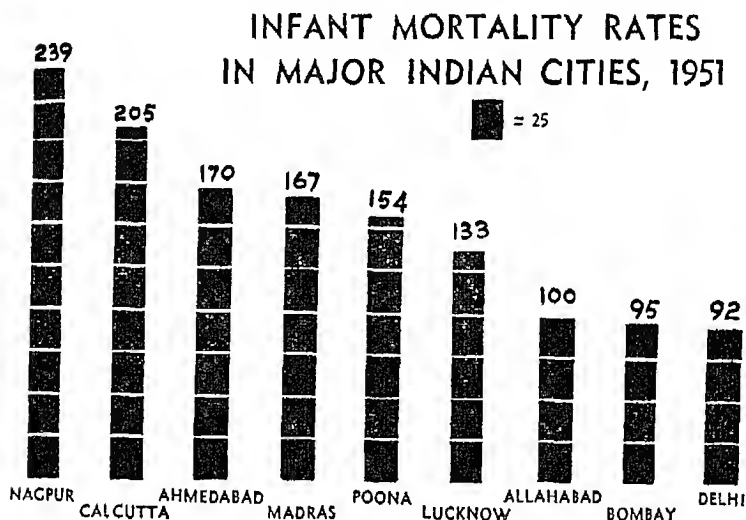
take place during the first four weeks — that is the neonatal mortality is roughly half of the total infant mortality; and of this, about 60 per cent occurs in the first week — that is the perinatal mortality is nearly three-fourths of the neonatal mortality. This provides a clue to the area of infantile morbidity which proves fatal and indicates the kind of measures to be taken to effectively reduce this abnormal rate.

Male infants have higher death rates than females of the same age. This is not only an all-India experience but it is also true of the various communities in India for which figures are available. As there is no male or female infanticide today, and the cultural bias, if anything, is in favour of the male, this fact confirms what is well known — that the female infants are biologically better fitted than male infants for survival. The sex distribution of infant mortality

reveals the operation of a sexually select mortality removing far more males than females.

Infant mortality rates in urban areas are invariably higher than those in rural areas. This is rather surprising, for in India a great majority of the general and maternity hospitals and nursing homes are located in urban areas where almost all general practitioners, gynaecologists and obstetricians practise. As a rule, more trained midwives operate in towns and cities as opposed to the untrained

CHART NO 4. *Infant Mortality Rates in Major Indian Cities, 1951*



*dais* who work in the villages. If some health and medical services are extended to all the villages, the prospects for a considerable decline in rural infant mortality appear to be bright. The general lack of health and medical services in the villages is apparently compensated by more space, fresh air and less overcrowding in the rural areas, for there appears to be a direct correlation between higher infant mortality rates and overcrowded sections of urban areas. Urban overcrowding implies not only so many adults per room but also poor or no sanitation and absence of personal and public hygiene in, for instance, the urban slum areas.

Unfortunately, Indian vital statistics are not classified on the lines of the British (United Kingdom) Registrar-General's seven social classes. However, the infant mortality statistics in some Indian cities are grouped according to communities. Though these cannot



be taken to be even roughly equivalent to the social classes as classified by the Registrar-General of the United Kingdom, the infant mortality rates of the various communities reveal a wide range from better-off to backward communities. For example, Harijans (the so-called untouchables) live in slums while some well-to-do caste Hindus live in fashionable residential sections of any city. Residence, to a considerable extent, reflects income, education, etc., of the family. The infant mortality rates range in magnitude according to the area of residence, type of dwelling, the availability of basic amenities, etc. It is needless to add that the rates in the slum areas are considerably higher than those in fashionable areas. In a word the high infant mortality rate in India, as in the West, is a product of poverty and insanitary urbanization and all that these imply.

## CHAPTER IV

# Causes of Infant Mortality

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'THE termination of an individual's life', writes Professor Titmus, 'is the product of an enormous number of complex and interrelated forces; from a Government's policy in international affairs to the local methods of refuse disposal and from a coal owners' decision to close the pits to a mother's intake of calcium. Reducing this diversity to identity, to find the causation of infant mortality, we can distinguish two main factors operating in the past to provide a high death rate. One can be summed up in the word poverty; the other in insanitary urbanization.'<sup>1</sup> There is no doubt whatever that a variety of factors, some known and some unknown, some controllable and some uncontrollable in the present state of our knowledge of conditions, particularly in under-developed areas, accounts for such infant mortality as exists in many parts of the world.

The problem posed by the causes of infant mortality is one of multiple causation. But because the problem is multifarious it does not mean that we cannot always isolate the major determinants. Isolation of the causes does not, of course, mean that we can be certain where one ends and another begins. They are, for the major part, overlapping and interrelated. However, it will be convenient for purposes of discussion to group these causes under four categories: (a) biological, (b) economic, (c) social and cultural and (d) medical and pathological. This is at best arbitrary and cannot be taken as a mutually exclusive and hard and fast division, for it is not always easy to decide where the economic factor ends and the cultural factor begins. However, it is convenient to examine the causes of infant mortality in India under these four headings.

Enough has been said about the nature of census figures and vital statistics in India. However, the problem may be looked at from the point of view of causes of infant mortality. If Indian vital statistics in the sense of mere registration of births and deaths are inadequate and inaccurate, the registered causes of mortality, where they exist, are even more so. A majority of deaths, including those of infants, occur outside hospitals and clinics and, by and large, unattended by physicians or any medical personnel. While more than 70 per

<sup>1</sup> Richard M. Titmus, *Birth, Poverty and Wealth* (London, Hamish Hamilton, 1943), p. 11.

cent of the population live in villages which have no hospitals or clinics, about 80 per cent of the qualified medical personnel live in urban India. As death certificates, showing cause of death, are not issued by the medical authorities for the registration area as a whole, it is difficult to establish precisely the medical and pathological causes for the high infant mortality in India. Since death registration is incomplete, the numerous socio-economic-cultural factors contributing and leading to infant mortality cannot also be adequately evaluated.

Though exact figures are not available it is known that a great majority of deliveries take place outside hospitals and maternity homes; births taking place in the home are not necessarily attended even by trained midwives. While actual figures are not available to establish percentages an informed guess would put the number of home deliveries, unattended by medical personnel, at about 70 per cent of total births. Even small sample inquiries into the cause of infant deaths have been impossible on account of difficulties in performing post-mortem examinations.

Infant mortality figures are relatively more reliable in certain major Indian cities like Calcutta, Bombay, Madras and Delhi. The series are relatively more reliable for the last thirty years — from 1925-55. Here, causes of death are also available because medical certification of death is more or less obligatory on the part of municipal authorities. This limited data covering only a fraction of the country's population does throw some light on the major causes of infantile morbidity and mortality.

#### (a) *Biological causes*

Before we can evaluate how far biological causes are responsible for infant mortality in India, a word must be said about a certain amount of infant mortality being outside human calculation. That is, in the present state of our knowledge, it is possible to contend that 'under the best circumstances a certain number of infants are bound to die in the first year of life, for the young of all species are subjected to special risks, and sometimes Nature herself does not build well enough to enable the tiny spark of life to survive'.<sup>1</sup> We cannot determine precisely what this 'natural' death rate is, since we cannot study mankind under purely natural conditions. On the other hand, it may be contended that Nature's apparent failures are really man's and woman's unknown faults. If all pregnancies were medically advised and occurred under ideal conditions and an

<sup>1</sup> William A. Brend, *Health and the State* (London, Constable, 1917), p. 62.

expectant mother had everything from the day of conception (and in fact from the day of her own conception) to a year after delivery, such as all conceivable prenatal care, balanced nutrition during pregnancy, expert gynaecological and obstetrical care during delivery, and all care for the infant during the first year, it is theoretically possible that the infant mortality rate, in such a community of cases, might be zero. But even under these assumed ideal conditions some slips beyond human control may occur and some infants may die. 'Just as in every packet of seeds there are some that do not germinate and in the young of every flock some which do not survive, so it would appear that mankind must inevitably lose a certain proportion of his offspring, and with his present knowledge, he cannot hope to prevent this loss.'<sup>1</sup> A case in point is the birth of a blue baby, to apparently healthy parents under what seem to be normal conditions, that fights a losing battle and fails to survive. This may mean, of course, that our knowledge is limited on why blue babies are born, and if it is the result of hormone disturbance, why such disturbance, and so on. However, it appears *in the present state of our knowledge* of these matters, a certain amount of infant mortality is inevitable. It is difficult to surmise what this minimum rate of death for any community is likely to be. It may be 5, 10 or 15 per 1000 live births. To begin with, this unaccountable factor must be reckoned as one of the causes of infant mortality. It is, however, possible that in the foreseeable future this present 'unavoidable minimum' of infant mortality, if such can be assumed, can be reduced to nothing.

The United Nations' Report on infant mortality in the course of a discussion of the biological factors associated with early wastage of life sums up the situation admirably: 'The following discussion of some of the most tangible biological factors which affect early mortality should not be misconstrued to mean that excess mortality found to be associated with these factors represents an inevitable wastage of life. Rather, the biological factors may at times be modified by changing social and economic conditions. For example, infant mortality has been found to vary with the order of birth, which is a biological factor, the highest mortality being found among first births and the highest orders of births. A reduction in the size of families and therefore in the proportion of births of higher orders may obviously have some effect upon infant mortality. The size of family, however, often varies inversely with the degree of social and economic advancement, the largest families being found in the under-developed areas of the world. In this situation, therefore, the degree to which the biological factor is permitted to operate seems to be to a large extent controlled by the social climate even though

<sup>1</sup> Ibid., p. 102.

the ultimate size of the family is immediately determined by the balance of fertility and mortality.

'Again, it is known that infants born in multiple births face a greater risk of death than do those in single births due in large part to the greater frequency of prematurity among the former. The incidence of multiple births is a purely biological phenomenon, which shows no class variations, but proper nutrition of the pregnant woman and careful prenatal medical care can somewhat reduce the incidence of prematurity among multiple births.

'Even if it were possible to isolate the purely biological factors, it would be difficult to determine the exact nature of the relationships which exist. Knowledge on these points is still far too meagre to permit an exact evaluation of the degree to which any of these factors affect the infant's chances of survival since most investigations so far undertaken have been limited to fairly small samples.'<sup>1</sup>

These observations are particularly true of India. At the outset it may be pointed out that there appears to be no conclusive evidence to show that there is any genetic or inborn factor responsible for excessive infant mortality. If a generalization is permissible it may be said that the known causes of infant mortality are almost all environmental.

There are at least five biological factors connected with infant mortality. They are the general level of mortality, the general level of fertility and the mother's age, and the birth order and extent of intervals between births.

In general, in India, as in other countries, a large share in the reduction of general mortality can be credited to the control of infant mortality, though the degree of reduction is not as significant as in many advanced countries. In fact, the percentage decline in infant mortality has not been as great as in general mortality. 'If we take the years 1916, 1917 and 1920 as our base, we find that the average general mortality decreased 27.6 per cent by 1936-40, whereas infant mortality declined only 19.6 per cent. But despite its failure to drop quite as fast as general mortality, infant mortality has nevertheless been reduced substantially according to official returns.'<sup>2</sup> In other words, the available data reveal that high infant mortality rates are associated with high rates of mortality at higher ages and vice versa.

What about the relation between infant mortality and general fertility? It is well known that in most under-developed countries

<sup>1</sup> *Foetal, Infant and Early Childhood Mortality*, Vol. 2 (New York, United Nations, 1954), p. 2.

<sup>2</sup> Kingsley Davis, *The Population of India and Pakistan* (Princeton University Press, 1951), p. 34.

high fertility and high mortality rates go together, while in certain advanced nations low fertility rates are accompanied by low mortality rates. This simply means that if more infants are born more infants will die, though it is also true that more infants will survive. Exceptions, however, are not wanting. In Holland, for example, a high fertility rate is associated with low mortality and a particularly low infant mortality rate.

This apparently simple relation between high fertility and high infant mortality can be misleading. Large families do not necessarily imply a high rate of mortality. The obvious relation between a high birth rate and a high infant mortality rate is probably due to the fact that most large families occur among the poorest classes — classes that are subject to heavy infant losses on account of alterable socio-economic factors.

The last set of biological factors that have direct bearing on infant mortality are the age of the mother, the order of birth and the time interval between successive births. Indian data for small samples confirm the definitive conclusions reached by more detailed studies abroad on the relation between infant mortality and age of mother and parity. Very young mothers, as is the case in rural India even today, have an adverse effect on infant survival. Similarly, the infant mortality rate is higher when the mothers are older women approaching menopause. In a word, infant mortality rates are greater when the mother is either very young or relatively old.

The relation of birth order to infant mortality is nearly a corollary from the relationship between the age of the mother and the incidence of infant mortality. If the mother is very young, the chances of the first baby surviving are remote. The other side of the picture is also true — the risk for the fifth and subsequent babies is definitely greater. 'Too many births to the same mother lessen the chance of survival for the children born last. The lowest mortality rates usually occur among second children. Although the risk of death does not increase substantially until the fifth birth, it then rises sharply, so that tenth or later children have only half as much a chance of survival as do second children.'<sup>1</sup> The series of figures from Calcutta city and those from the Poonamallee Survey bear this out.

And last, it has been established that the shorter the time interval between the termination of a gestation and the beginning of the next conception, the greater the risk to the survival of the baby. In other words, the desirable interval of three or four years between births ensures optimum survival rates. The time interval between successive births is conditioned by several factors such as patterns of sexual behaviour, traditional *mores* concerning lactation, family planning

<sup>1</sup> *Foetal, Infant and Early Childhood Mortality*, p. 9.

habits, if any, and 'involuntary' deviations such as wars and epidemics. Whatever the reason, it is now conclusively established that the greater the interval between births, the lower the chances of infant deaths. Woodbury, Burns, Yerushalmy, Baird and a score of other investigators have demonstrated this interrelationship. Such data as are available in India for small samples lend support to these findings.

*(b) Economic causes*

How far economic causes, in the sense of poverty, low income and consequent low standard of living, are responsible for infant mortality has been the subject of many inquiries. A few studies in the United Kingdom, the United States of America and several European countries have established that nearly 90 per cent of infant deaths occur among the poorest families. For instance, according to Woodbury, more than nine-tenths of all infant deaths in the United States occur among the poorest 30 per cent of the families. In the United Kingdom, Titmus shows from official data that infant mortality rates gradually increase with the descent in the social scale, which is roughly equivalent to the gradations in income groups. The Thousand Families Survey in Newcastle upon Tyne shows that infant illness and deaths and bad housing go together. Other studies in France and Canada bear this out rather strikingly. That poverty is the major factor responsible for high infant mortality does not need any statistical demonstration when it is realized that family income is the end-product of such factors as the kind of employment or occupation of the father (and sometimes the mother as well), the father's literacy and educational attainment, the family's general cultural level and social status, etc.

While we do not have in India adequate and direct evidence on this question on the basis of field studies, we do have sufficient indirect evidence to establish a direct correlation between low income and all that it connotes and high infant mortality.

The monthly income of the father and of the mother if the mother is an earner, conditions the nature of housing, diet and medical attention; the family income also reflects the occupation, class and social status of the family. The term 'economic class' in the sense of a particular income group and 'social status' in the sense of an arbitrarily evaluated hierarchy of jobs are more or less interchangeable, for in a majority of cases, economic classification decides the social status.

That in India income, more than anything else, decides the kind of residential area and the nature of housing is clearly evident in cities. The poorest dwell in the blighted or slum areas where the city

administration spends the least on amenities such as well-laid roads, potable water, and sanitary facilities such as conservancy, mosquito control, drainage, etc. The incidence of morbidity in these areas is always higher than in the better class residential areas. For instance, in Bombay and Madras cities, the annual Municipal Administration Reports reveal that infant mortality rates are highest in the slums and *cheries* and lowest in the richer residential localities.

Income also decides the nutrition of the family and particularly of the expectant and nursing mother. Lack of stamina, to begin with, is aggravated by defective diet, qualitatively and quantitatively. This factor accounts for the high incidence of stillbirths and neonatal mortality. (Although poverty constitutes a menace to child health in many ways and particularly in the direction of malnutrition, poor nutrition may be prevalent in the homes of the wealthy as well as among the poor as a result of poor knowledge, faulty selection of foods, overfeeding, etc.) When the inability to obtain adequate medical aid is taken into consideration, normal infantile ailments which can be controlled and cured when prompt medical attention is available, result in premature mortality. From the data available in the United States, where the material effects of class distinction are not so appalling as in India and other countries in Asia, Sydenstricker concludes: 'From data such as these, although they do not take into account heredity as a factor, it is difficult to escape the conclusion that the major determinants in the mortality of infants over one month of age is a complex of environmental conditions among which the economic status of the family is a dominant factor.'<sup>1</sup>

According to Dr. Leslie Banks: 'Studies at Toronto, Philadelphia and Harvard showed conclusively that the dietary habits of the mother affect her condition during pregnancy, labour and convalescence and also the health of the baby after birth. In the Toronto experiments, women whose diet was supplemented by milk, eggs, cheese, oranges and vitamins suffered less during pregnancy from anaemia and toxæmia and women who had been on this diet for only a short period showed such a change in their outlook in the pregnancy itself and on life in general that an improvement in attitude and bearing was readily evident to those in charge of the clinics.' These findings were supported by the Harvard and Philadelphia studies and especially noticeable was the decreased severity of nausea and sickness, toxæmia and fatigue.

'The results of improved diets on labour were equally striking. In the Toronto group, the number of cases of prolonged or difficult labour was reduced, and premature births and stillbirths were fewer.

<sup>1</sup> E. Sydenstricker, *Health and Environment* (New York, 1937), p. 84.



The experience of the Philadelphia Lying-in-Hospital was similar, for premature births and stillbirths were both much more frequent in women on a poor diet.

'It is an interesting point also that complications during labour are more marked in those on an inadequate diet in spite of the fact that the babies may be lighter in weight. This is of some importance in Eastern countries, where it is the custom to keep the expectant mother on a light diet so that she may have a small baby and an easy delivery. Here there is the danger of the vicious circle, for deprivation and seclusion may result in osteomalacia (adult rickets) with such deformity of bones that normal delivery may be impossible. The differences appear again when the nursing powers of the mother are considered, for those on a full diet can continue to breast-feed their infants whereas those on a low diet often stop after the first few weeks.

'The advantages of breast feeding are so obvious that there is no need to enlarge upon them but the relationship between the state of nutrition of the expectant mother and the health of the infant is less well recognized. It is obvious that the relationship between infant and mother is so close that risks which affect the mother may endanger the child. Clearly premature births do so, but it is also true that infant deaths in the first few weeks of life and especially in the first week depend much on the health endowed by the mother. Such matters as slow progress and diminished resistance to infection are difficult to measure accurately, but expert opinion is agreed that infants of well-nourished women do better than those of mothers who are under-nourished. . . .

'The precise nutritional requirements vary with each person but it is obvious that a patient with an adequate supply of first-class proteins and iron will, for example, stand less chance of anaemia than one who is not obtaining these in sufficient quantity. Similar considerations apply to the post-natal period, for adequate nutrition will help to safeguard against such conditions as anaemia and infection. The investigations in Britain of the Joint Committee of the Royal College of Obstetricians and Gynaecologists, the Population Investigation Committee and the Institute of Child Health published under the title of *Population Studies* in 1949 showed that during the first two years after delivery, 40 per cent of mothers suffer from some discomfort or disability following child birth. The complaints may not be serious but 26 per cent still had symptoms two years after delivery. The need for adequate ante-natal and post-natal care in addition to skilled attention during delivery is obvious.'<sup>1</sup>

<sup>1</sup> A. Leslie Banks, *Social Aspects of Disease* (London, Edward Arnold, 1953), pp. 281-3.

The disadvantages of a new-born infant in a poor, insanitary and unhealthy environment and the family's poverty and consequent inability to afford even a modicum of adequate nutrition and medical assistance are obvious. But it is difficult to determine how far inheritance of physical constitution is associated with social class and income groups. Do the infants of the rich and professional classes inherit better constitutions than those of the poor and the working classes? While the available evidence is not decisive, the disadvantages of generations of poverty and substandard environments may be reflected in genetic endowments. This does not of course mean that the poor compared to the rich are constitutionally unfit, for, on the contrary, generations of exposure to undesirable circumstances might generate a better constitutional resistance to environmental hazards. Writing on the relation between poverty and infant mortality in the United Kingdom, Lord Boyd Orr observes: 'It used to be assumed that the poor represented an inferior strain of the population and that the high infantile mortality among the poor was Nature's method of eliminating the unfit. This view, which would absolve us from doing anything to abolish poverty, is not supported by facts. Where the infantile mortality rate is the highest, the survivors are of the poorest physique and vice versa. The factors which make for high infantile mortality seem to be the factors which make for ill-health and poor physique among the survivors. There is no doubt about the importance of heredity but we cannot dogmatize about inherited differences in health and physical fitness between the well-to-do and the poor until the environmental conditions affecting the health and physique are comparable in both classes. Of these environmental factors, nutrition seems to be of prime importance, because the results of the feeding tests show that when the diet of the children of the poorer classes is improved, making it more like that of the well-to-do, the rate of growth of the children approaches that of children of the well-to-do class, and there is a noteworthy improvement in health and physique.'<sup>1</sup>

Economic status in another sense influences the health of the mother. Inability to afford any domestic help, stretching the rupee to meet the needs of the husband, children and, last, herself, and constant worry, undermine the efficiency of the mother. While it is difficult to estimate precisely what part of infant mortality is due to maternal overall weakness, the direct relation between the overburdened mother and infant morbidity and death is obvious. 'A gradual deterioration in the mother's health would obviously react unfavourably on the infant particularly through the medium of maternal efficiency.' As Marjorie Spring Rice observes: 'It is of

<sup>1</sup> *Nature* (1939), 144, 734.

course a vicious circle . . . the husband and children must come first and as more of her (the mother's) energy and strength are consumed in this first care, she is obliged to omit the extra effort needed for herself.<sup>1</sup> It is a truism that poor-class wives have more children than the wives in the highest income groups. The amount of time a mother can devote to the care of her baby is determined partly by the size and range of the family. Too many children too badly spaced can only mean rationed care, not only to the children but also to the mother.

Even in a predominantly middle-class country like Sweden where extremes of wealth and poverty are largely absent, we have differentials in infant mortality on the basis of income. According to Mrs. Alva Myrdal: 'When infants die, although medical knowledge knows how to prevent it, the technical development of a civilization has most cruelly out-distanced its humanitarian development. . . . The difference of infant mortality of 4.89 per cent and 1.43 per cent in the two income groups at the extreme ends of the scale is a grave accusation in a society that believes itself to be a democracy. There can be read in such figures what an uneven income distribution does to those who have nothing to do with its causes but all to do with the future of the country. Differences in family income mean differences in food, housing and medical care. A programme of population policy becomes a programme of humanitarian justice when it tries to equalize these very differences.'<sup>2</sup>

It is now established, other factors being equal, that poverty is a potent cause for the high incidence of infant mortality. If this is true of relatively advanced countries such as the United States, Sweden and the United Kingdom, it is much more true of India. We have observed elsewhere how different residential areas register different rates of infant mortality in India, the lowest in the fashionable Park Avenue areas and the highest in disreputable slums. Only one factor — that of income — decides where a family lives, whether in India or in England.

Along with housing go other important factors such as drainage, garbage and other refuse disposal, running water and general sanitation and hygiene. The availability of prompt, efficient and expert medical care is conditioned in India, where any kind of national health insurance is totally absent, by the ability of the family or the patient to pay. Low income sometimes connotes in India other factors such as lack of parental education and knowledge of child care and mothercraft. Thus the absence of material resources

<sup>1</sup> M. S. Rice, *Working Class Wives: Their Health and Condition* (London, 1939), p. 32.

<sup>2</sup> Alva Myrdal, *Nation and Family* (New York, Harpers, 1939), p. 60.

leads to a chain of related factors — all leading up to a greater incidence of infant illness and death.<sup>1</sup>

### (c) *Cultural and Social Factors*

Numerous cultural and social factors, ingrained in the traditional communal *mores*, affect adversely infant welfare and survival in any country, and India is no exception.

Before we discuss the cultural and social factors that have played in recent years and continue to play today a vital role in India, a factor of some historical importance — infanticide — may be referred to here. It is debatable whether infanticide can be called a social or cultural factor. But as the practice stemmed from the social *mores* of the people (Hindus), and their attitude towards women, infanticide may be treated as an unhappy part of the cultural set-up of the country before the beginning of the present century.

During the last half of the nineteenth century, administrative, police, census and other official reports refer to the practice of infanticide in certain parts of India. We have also reports of the efforts of the British Government in India to put down this practice. This period is outside the limits of the present survey. However, even after the 1901 census, occasional reference is made in certain official documents to infanticide as a cause of infant mortality. There are of course no statistics for no one is likely to voluntarily report a criminal act. There is no doubt that the practice did exist among certain groups like the Rajputs and the Gujaratis. But it is difficult to establish or deny the vogue of infanticide after the turn of the century.

According to the Census Report of 1901: 'The Superintendent of Census in Bombay says that female infanticide was formerly in vogue among certain tribes in Sind and the Rajputs in Cutch. The common method of destruction was to drown the infants in vessels of milk in holes made in the ground and filled with the same liquid. *Dudh Pilao* given at the birth of a female infant was sufficient to secure its destruction. In other cases, female infants were either given opium or left uncared for until they expired. At the present day, says Mr. Euthoven, the practice may be assumed to be of rare occurrence. The same view is held by Mr. Burn in respect of the United Provinces where however a special law is still in force for the supervision of certain clans resident chiefly in the tracts adjoining the Punjab who were undoubtedly at one time addicted to the practice. In Baroda the Census Superintendent asserts that amongst the Lewa Patidars of certain Kulin villages, there are clear signs of female

<sup>1</sup> Muktha Sen, 'Maternity and Child Welfare Work in Singhur Health Centre', *Mother and Child* (London), December 1950.

course a vicious circle . . . the husband and children must come first and as more of her (the mother's) energy and strength are consumed in this first care, she is obliged to omit the extra effort needed for herself.<sup>1</sup> It is a truism that poor-class wives have more children than the wives in the highest income groups. The amount of time a mother can devote to the care of her baby is determined partly by the size and range of the family. Too many children too badly spaced can only mean rationed care, not only to the children but also to the mother.

Even in a predominantly middle-class country like Sweden where extremes of wealth and poverty are largely absent, we have differentials in infant mortality on the basis of income. According to Mrs. Alva Myrdal: 'When infants die, although medical knowledge knows how to prevent it, the technical development of a civilization has most cruelly out-distanced its humanitarian development. . . . The difference of infant mortality of 4.89 per cent and 1.43 per cent in the two income groups at the extreme ends of the scale is a grave accusation in a society that believes itself to be a democracy. There can be read in such figures what an uneven income distribution does to those who have nothing to do with its causes but all to do with the future of the country. Differences in family income mean differences in food, housing and medical care. A programme of population policy becomes a programme of humanitarian justice when it tries to equalize these very differences.'<sup>2</sup>

It is now established, other factors being equal, that poverty is a potent cause for the high incidence of infant mortality. If this is true of relatively advanced countries such as the United States, Sweden and the United Kingdom, it is much more true of India. We have observed elsewhere how different residential areas register different rates of infant mortality in India, the lowest in the fashionable Park Avenue areas and the highest in disreputable slums. Only one factor — that of income — decides where a family lives, whether in India or in England.

Along with housing go other important factors such as drainage, garbage and other refuse disposal, running water and general sanitation and hygiene. The availability of prompt, efficient and expert medical care is conditioned in India, where any kind of national health insurance is totally absent, by the ability of the family or the patient to pay. Low income sometimes connotes in India other factors such as lack of parental education and knowledge of child care and mothercraft. Thus the absence of material resources

<sup>1</sup> M. S. Rice, *Working Class Wives: Their Health and Condition* (London, 1939), p. 32.

<sup>2</sup> Alva Myrdal, *Nation and Family* (New York, Harpers, 1939), p. 60.

leads to a chain of related factors — all leading up to a greater incidence of infant illness and death.<sup>1</sup>

### (c) *Cultural and Social Factors*

Numerous cultural and social factors, ingrained in the traditional communal *mores*, affect adversely infant welfare and survival in any country, and India is no exception.

Before we discuss the cultural and social factors that have played in recent years and continue to play today a vital role in India, a factor of some historical importance — infanticide — may be referred to here. It is debatable whether infanticide can be called a social or cultural factor. But as the practice stemmed from the social *mores* of the people (Hindus), and their attitude towards women, infanticide may be treated as an unhappy part of the cultural set-up of the country before the beginning of the present century.

During the last half of the nineteenth century, administrative, police, census and other official reports refer to the practice of infanticide in certain parts of India. We have also reports of the efforts of the British Government in India to put down this practice. This period is outside the limits of the present survey. However, even after the 1901 census, occasional reference is made in certain official documents to infanticide as a cause of infant mortality. There are of course no statistics for no one is likely to voluntarily report a criminal act. There is no doubt that the practice did exist among certain groups like the Rajputs and the Gujaratis. But it is difficult to establish or deny the vogue of infanticide after the turn of the century.

According to the Census Report of 1901: 'The Superintendent of Census in Bombay says that female infanticide was formerly in vogue among certain tribes in Sind and the Rajputs in Cutch. The common method of destruction was to drown the infants in vessels of milk in holes made in the ground and filled with the same liquid. *Dudh Pilao* given at the birth of a female infant was sufficient to secure its destruction. In other cases, female infants were either given opium or left uncared for until they expired. At the present day, says Mr. Euthoven, the practice may be assumed to be of rare occurrence. The same view is held by Mr. Burn in respect of the United Provinces where however a special law is still in force for the supervision of certain clans resident chiefly in the tracts adjoining the Punjab who were undoubtedly at one time addicted to the practice. In Baroda the Census Superintendent asserts that amongst the Lewa Patidars of certain Kulin villages, there are clear signs of female

<sup>1</sup> Muktha Sen, 'Maternity and Child Welfare Work in Singhur Health Centre', *Mother and Child* (London), December 1950.

infanticide, and the figures which he gives certainly show an extraordinarily low proportion of females.

'But if the practice of deliberately doing away with female infants is now confined to a limited area, and even there is perhaps somewhat rare, there is little reason to doubt that in most parts of India, female infants receive far less attention than males. It is almost universally the case that, whereas male offspring are ardently desired, the birth of a female child is unwelcome. It is especially so where the provision of a husband is a matter of difficulty and expense and where there are already several female children in the family. Consequently, even if there is no deliberate design of hastening a girl's death, there is no doubt that, as a rule, she receives less attention than would be bestowed on a son. She is less warmly clad, and less carefully rubbed with mustard oil as a prophylactic against the colds and chills to which the greater part of mortality amongst young children in India is due; she also probably is not so well fed as a boy would be, and when ill, her parents are not likely to make the same strenuous efforts to ensure her recovery. It seems clear therefore that even if they are constitutionally stronger than boys, girls in this country, especially amongst the Hindus, are less likely than in Europe to reverse the birth proportion of the sexes by a relatively low mortality during the early years of life.'<sup>1</sup>

Perhaps the most important factor affecting infant welfare is the societal attitude towards human reproduction in general and the role of the expectant mother in the home and the do's and don'ts that confront her during her confinement. Unfortunately, in Hindu culture as practised, and in other minority cultures influenced by the Hindu culture in India, confinement is considered ritually unclean and ceremonially impure. Therefore, several unhealthy taboos surround confinement, from the lying-in-room to infant clothing and feeding, taboos that are at variance with the available medical knowledge.

Dr. K. C. Bose, writing in 1912, presents what is really an accurate picture of the conditions attending the confinement of a woman in India. Though he is specifically describing the conditions among people in Bengal, particularly the Marwaris, some forty-five years ago, it must be admitted that the description is true of most other communities as well. The picture is depressing and those who know the average Indian home will note that the author has not exaggerated at all. It is sad to contemplate that conditions have not radically changed for the better during these last forty-five years in a majority of Indian communities and homes.

'From the description of their lying-in-rooms you will at once find

<sup>1</sup> H. H. Risley and E. A. Gait, *Census of India, 1901, Vol. I. Part I. Report* (Calcutta, Superintendent of Government Printing, 1903), p. 115.

that they of their own accord create factors of disease and death and their imprudent actions at times become culpable; with a little digression from the main subject, I would try to give you an outline of a model of a lying-in-room with its equipment to enable the conference to form an idea of the magnitude of evil they foolishly court to satisfy the whims and fancies of their elderly ladies who are supposed to understand the management of labour cases better than their medical advisers and qualified midwives.

There is no special site for the selection of a lying-in-room. In a moderately rich house, the worst, the most ill-ventilated room, better if it stands near to a privy, is reserved to serve the purpose of a confinement room during emergency. Before the parturient woman is taken into it, the elderly ladies of the house carefully examine whether all its openings have been well covered with canvas purdahs to prevent the access of air, which kind God has given free of all charges to all creatures under the sun. After having satisfied themselves on all points, they allow the expectant mother to occupy her bed in the room. The room, in total disregard of its dimension, is unequally divided into two compartments by a screen made of old torn sacks impregnated with dust and germs of diverse kinds; the smaller compartment is reserved for the mother and the child, and the bigger one for the accommodation of the matrons and the maids of the house. A low and filthy class of women, vulgarly called "chammarnis", are engaged to discharge the function of midwives who are thought capable of doing anything necessary for the occasion and they are entrusted with the toilet of the child. You would, I doubt not, be disagreeably surprised to learn that the special function of the officious ladies of the house is to see that the mother does not fall asleep and they obstinately deny her this comfort for full five days. They consider sleep during the early period of confinement to be an evil which brings diseases and death to the mother. This practice has now been to a certain extent modified and the poor mother is allowed to sleep for a couple of hours during early morning. The mother after her delivery is laid on a charpoy with an old blanket to serve the purpose of a mattress and well covered with a quilt. All nourishment is denied to her and for five days she is to live upon a sluff made up of molasses, gum acacia and *ajawan*.

We now turn to consider the fate of the child. If the child is exhausted and does not cry after his birth, it is left aside and taken for stillborn. If it cries, the *dai* divides the cord with a split bamboo or with an old rusty knife as circumstances would allow and then ties it up with thread. The bleeding, if any, is stopped by putting a piece of cotton wool over the wound. The child is then hurriedly wiped with a piece of soft linen soaked in mustard oil and the



“vernix caseosa” is thus partially removed. When the toilet of the baby is finished it is well covered up with old rags selected from the refuse of clothes used by its ancestors. The ancestral old rag is considered to be an emblem of longevity. The face of the child is also well covered with clothes and it is very nearly smothered; the poor little thing is allowed to breathe its own respired air which he gets from what is confined within the various layers of his ragged garments. A *chirag* is kept burning day and night and live charcoal is also kept within the room to keep it warm. The fire and the lamp consumes the greater portion of the oxygen of the room. Carbonic acid gas poisoning is not a rare accident of the lying-in-room of the *Marwaris* and *Banias*. I remember an instance where 13 women had to be dragged from the jaws of death and at this time whoever entered the room to rescue the inmates felt giddy and fell down unconscious and the whole thing was attributed to the doing of an evil spirit. The veranda of the room which forms its appendage is not void of its decoration; it is equally protected against the wind and forms the resting place of the confidential servants of the house, who stay there during the night. They are well supplied with their usual ration of *ganja* and *bhang* which they enjoy to their heart's content. Their duty is to keep the inmates of the room awake and they do this by firing Chinese crackers almost every five minutes. Their deafening sounds often prevent neighbours from enjoying rest during the night. I have a drawing of the lying-in-room and you can well imagine the amount of evil it does to the health of the mother and the child. One would be agreeably surprised to find a mother and her child come out safe after their period of confinement which generally extends to 40 days. The Bombay *banias* seldom use crackers nor do they keep the mother awake. The vagaries of these two classes of people do not cease with the conversion of the confinement room into a black hole. They also unconsciously and foolishly poison the infant by putting opium into its mouth as soon as it is ushered into the world. In rare instances the practice of giving opium to an infant as its daily ration is delayed till it attains the age of 40 days. Cases of opium poisoning often fall to the lot of medical practitioners who practice amongst these people. Amongst the well-to-do class of Mahomedans, the lying-in-room is often kept closed but not absolutely air-tight. They also put live charcoal into the room. The toilet of the infant requires special attention to enable the members of the conference to understand how far it is prejudicial to the interests of health. The “Mamens” and the “Soorties” who belong to the high-class Bombay Mahomedan domiciled in Calcutta, whose number is pretty large, bind their infants with several pieces of cloth to prevent free movement of

the limbs. They take four square pieces of cloth each measuring 18 inches of the size and shape of a pocket handkerchief folded from corner to corner to form into a triangle with its base upwards and tied round the infant in the following order, the first piece tied tight round the chest and upper arms of the infant, the second round the abdomen and the upper half of the forearms, the third tied round the waist and forearms and the fourth round the thighs and knees. The legs and feet are covered with a sufficiently broad piece of cloth but not likely tied up. All the knots are placed in front and they project upwards. In lifting up the child the mother or the nurse puts one hand under its neck and with the other holds one of the knots.

'I would now pass on to consider infant feeding and its effects upon the health of the child. It is a popular belief that the child cries when it feels hungry and stops when it is put to the breast. Over-feeding and under-feeding are considered as relative terms having no intrinsic value of their own in the rearing of infants, and diseases and discomforts arising from these sources are often ignored. The majority of our people do not understand how the quality and quantity of a mother's milk are affected by the condition of her mind and body. A mother living under so many sanitary disadvantages cannot reasonably expect her child to be strong and healthy.

'Amongst numerous diseases which infants are liable to, tetanus and convulsions deserve special mention. The one comes before the child has completed the first fortnight of its life, the other often after it. Both are preventable diseases and with a little care and attention they could be made things of the past, but the task of doing it is a problem which I fear will long remain unsolved. Cleanliness is next to Godliness; but cleanliness of person is greatly at a discount in the Indian lying-in-room. With the exception of a limited number of the educated and enlightened class of people, the use of soap during the ablution of the child is almost unknown. Two baths are generally given to the child during the whole period of its confinement to the maternity room, and baths according to the ideas of the elderly ladies means sprinkling of tepid water over the head and body of the child. Head to foot bath is seldom given to the mother or the child.'<sup>1</sup>

Dr. A. Lankester of the Government of India, writing in 1924, corroborates Dr. Boses's observations. He points out:

'The practices which are found to exist are founded upon three sets of ideas; firstly, the religious belief that a woman at the time of childbirth is ceremonially unclean, more defiling in fact than the lowest outcast; secondly, the belief that fresh air, whether warm or

<sup>1</sup> K. C. Bose, 'Infantile Mortality: Its Causes and Prevention', *The Proceedings of the Second All-India Sanitary Conference Held in Madras, 1912* (Simla, Government Central Press, 1913), Vol. II, p. 324.

cold, is dangerously harmful for mother and child, being the usual cause of puerperal fever; and thirdly, a group of superstitious and old-fashioned theories as to medical treatment which naturally differ in various parts, but usually tend towards the extreme depression of the mother's physical strength during the lying-in period.

The belief that the woman at this time is unclean and a source of defilement to others determines the whole entourage of confinement. The room chosen must be not one which is used by other members of the household, and in actual practice it is very commonly a closet or outhouse with dung plastered mud floors and walls and the smallest possible doors and windows which are always kept rigidly shut. In some parts of Bengal a minute booth or shelter for the purpose will be constructed of matting in the backyard. The same idea dictates that it is an absurdity to use anything clean for one who is herself unclean, and so the oldest, dirtiest, coloured rags are often used, while as a matter of ordinary fact, the midwife in place of the spotless clothing protected by the sterilized "overall" of the West, delays to attend until she shall have exchanged her ordinary working costume for the dirty clothes suitable for the occasion, and used probably many times before without being washed.

Perhaps the hardest of all the consequences of this idea is the fact that it banishes the girl's own mother at the very time, if ever in a lifetime, a mother's help is needed. While, in some parts, it is permissible for the mother to enter the room on condition of her undergoing special ceremonial cleansing afterwards, special sets of clothing being reserved for the occasion; yet, in the vast majority of cases the presence of the mother is forbidden. This would matter less if the midwife was one in whom confidence might safely be placed. But this is far indeed from being the case. Dirty in habits, careless in work, and often callous to suffering, bold in treatment, with courage born of gross ignorance, and which causes untold mischief to her patients, the Indian *dai* belongs to a profession which, more than almost any other, is in urgent need of reform. Its very nature, as things are now, limits it to women of the lowest class while the fact that it is hereditary, one individual regarding it as her right to have the care of a limited group of families, removes the incentive of competition and rivalry. I have traced the course of a single woman of this sort for years amongst the respectable Hindus of a large city, her operations being continuously followed by a trail of puerperal fever and death. She and those like her would make frequent internal examinations, never using water to cleanse their hands until the end of the case.<sup>1</sup>

<sup>1</sup> A. Lankester, *Lecture on the Responsibility of Men in Matters Relating to Maternity* (Simla, Government of India Press, 1924), p. 5.

*The Dai*

The second major social factor that is responsible for the high infant mortality in India is the role of the *dai*. The *dai*, usually a woman of the barber caste, is the traditional midwife in India. For nearly a century, Indian and foreign writers have drawn the most terrifying pictures of the person, equipment and doings of the indigenous *dai*. The Government, medical authorities and social reformers have attacked her through the years and have pointed out her distressing role in the tragic and inordinate maternal and infant mortality in India.

The *dai* is an illiterate and an extremely ignorant woman, drawn from one of the most under-privileged castes in Indian society. She is divorced from any knowledge of basic and elementary rules of health, not to speak of any understanding of the rudiments of midwifery or gynaecology. Want of knowledge is one thing, but with the *dai* it is a worse case of rank superstition and old wives' tales. Her assistance in normal deliveries is bad enough but in abnormal cases the result is, more often than not, painful death. And yet, it is easy merely to criticize her. She has played a necessary, if damaging, role in assisting women in confinement through the years. Since a great majority of infants arrive in rural India where no medical personnel of any grade is available, not to speak of maternity hospitals or nursing homes, the *dai* has become indispensable. The Bhore Commission pointed out that she has great influence over the common people and any plan to educate mothers on this question without the *dai's* active co-operation was bound to fail. Any plan to ban the *dai* without the provision of a suitable and trained substitute can only be disastrous. Undesirable as she is, she cannot be banished under the existing conditions. A reason underlying the hostility of the *dai* towards the health authorities is the fear that restrictions placed on her would deprive her of her work and the traditional emoluments she is entitled to. Secondly, a woman of her status cannot believe that her 'midwifery' is faulty and that the new methods suggested by the authorities are an improvement on her own. One authority has pointed out that a mere washing of her hands before assisting in the confinements and the avoidance of interference with the normal course of delivery would improve the situation considerably! The meddlesome midwifery of the *dai* is as much a part of the cultural scene as the absence of trained medical personnel during labour. It is of course impossible to estimate how much the *dai* contributes to the present high infant and maternal mortality. On the basis of circumstantial evidence one may say that it must be considerable.

*Illegitimacy*

It is seldom recognized that illegitimate birth is a contributing social cause of infant mortality. Besides the general adequate nutrition of the mother and particularly through her pregnancy, and competent and trained supervision during confinement, a most important requisite for healthy motherhood is peace of mind and emotional stability. It is in this respect that the married mother has a great advantage over the unmarried mother. It is true that in India the problem of the unmarried mother is not of serious proportions. At least this is the popular assumption; no adequate or reliable statistics are available of the incidence of illegitimate birth for the country as a whole. When the registration of legitimate births is woefully incomplete, that of illegitimate ones must be even more so. No matter what the magnitude, the problem is with us. It has been established in even fairly advanced countries — advanced in the sense of their progressive attitude towards the unmarried mother — that the death rate of the illegitimate infants is much higher than that of legitimate children. This is true of the United States of America, Great Britain and several European countries.

The reasons are obvious. The illegitimate child bears the burden of the parents' delinquency. And the child suffers from the unkind verdict that society puts upon the often unguarded, isolated and unprotected mother. While the attitude of the people and the governments towards the unmarried mother are undergoing a welcome change in recent years in most advanced and Western countries, the attitude in India still smacks of puritanical harshness and lack of sympathy. The usual difficulties are the desertion of the father and, when found, his denial of paternity. The unmarried mother has to conceal her pregnancy as far as possible. Parents and relatives of these mothers, especially when they are economically underprivileged, tend to be cruel and harsh. Then there is always the possibility of venereal disease. It is true that the rigour of these problems is sought to be mitigated by the work of such voluntary agencies as the Rescue and Vigilance Homes and *Seva Sadans* but the chances of an illegitimate infant surviving the first year are definitely less than those of a legitimate one.

When the baby does arrive numerous problems arise. Can the baby remain with the mother? Can she support it without any external financial aid and in the face of possible social stigma? If the baby is to be given in adoption, breast feeding will be out of the question. Even under the best possible circumstances, the illegitimate baby gets less than the conventional care that legitimate babies, even in under-developed countries, receive. Neither society nor govern-

ment in India have sufficiently awakened to the need for tackling this problem.

### *Home Delivery*

Some needless infant deaths can be attributed to the lack of hospitals and physicians' care. In India, the reason behind this is largely economic as the country cannot afford in the present state of her development the needed hospitals, maternity homes and trained medical personnel. While this absence of hospitals and clinics is due to economic causes, the preference of the people to confinement at home, and going to the hospital only as a last resort, is a social factor. The average mother in India has an inexplicable distrust of the hospital where the atmosphere and set-up are so alien and far removed from her own home.

There is a familiar controversy in this connection on what constitutes the ideal place to have a baby — the home or the hospital. A hospital is undoubtedly the best place to have a baby, that is, if the hospital is properly staffed and operated. And though it is true that in India many hospitals, particularly the free, tax-supported, government general hospitals, provide a low grade of care, care in the home is infinitely worse because of the ignorance of the women who attend the delivery and, of course, the lack of any trained medical personnel as well as aseptic conditions. Professor Dugald Baird in the course of a discussion on the merits of home delivery versus hospital delivery points out: 'The argument that childbirth is a natural event and should take place at home does not guarantee that everything will be normal. It fails to take account of the fact that even in the most fit women complications may still occur and that many women are of poor physique and health, and are far from well during pregnancy. Added to this, many homes are unsuitable for even a normal confinement and many doctors have had little training in obstetrics and in the past have learned largely by mistakes.'<sup>1</sup>

### *The Indian Cradle*

Many infants die of asphyxia and this is often traced to the cloth cradle, a kind of hammock, in use in a great majority of Indian homes. The practice is to sling a sari or a bed sheet across a wooden rafter and tie the ends together. This makes a convenient cradle, for it is cheap and can be hung anywhere, including the branch

<sup>1</sup> Dugald Baird, 'The Future of Obstetrics', *The Transactions of the Edinburgh Obstetrical Society* (1952-53), p. 23.

of a wayside tree. The cradle is easy to operate, for all that the mother has to do is to give it a gentle push and it rocks the baby to sleep. But medical workers have pointed out from years of experience that the new-born and the young infant is sometimes turned over when the cradle is in motion and assumes the face-downward position; and when the cradle cloth is too thick, the baby experiences difficulty in breathing and, as it cannot turn over, it is gradually suffocated to death. This unhappy ending is usually prevented when the mother is around to push the cradle or look into it. But when working mothers leave their infants in such cradles for any length of time, they sometimes return to find babies who are no longer alive. The reasons for using this cradle are not primarily economic; it is used even in well-to-do homes. This is a part of the Indian cultural pattern and parents have to be educated out of this practice.

### *Mothercraft*

And yet another important factor contributing to the high infant mortality rate is the ignorance of the average mother on how to take care of infants, especially when they are beset by infantile ailments which are easily curable. Mothers, unfortunately, have not the instinctive knowledge of a bird or a cat of how to rear their young. In our dirt-dominated and poverty-stricken slums, in our backward villages, and often even in well-to-do urban homes, mothers display an extraordinary lack of knowledge regarding the feeding, clothing and general care of the infant. Mothercraft is a difficult art and many a mother learns it by paying the dear price of the loss of one or two or her infants' lives.

### *Absence of Family Planning*

We might include here the absence of the family planning habit among rural families and low-income urban families as a cause of high infant mortality. To put it more positively, the lack of both spacing and limiting births is a well-known factor in infant mortality. The urge and the ability to plan one's family is the product of economic, social, psychological and other factors but the absence of planned parenthood in India today is due more to cultural and social factors than to anything else. In India, few pregnancies are really planned. Almost all of them are accidental. Some of these unadvised pregnancies are really ill-advised in the sense that the mothers are either physically unfit to bear any more babies or the family cannot afford the necessary minimum care for another baby.

Fortunately, the country has, of late, become greatly conscious of

the need for family planning. The Government of India as well as several State Governments have recently undertaken vigorous measures to spread the family planning habit among the people through mass media. Knowledge of the mechanical, non-appliance and surgical methods of conception-control are being disseminated among the people. In a decade or two the total number of births in a family may become considerably less than the present number. The fewer the babies born, the fewer, of course, will be the infant deaths.<sup>1</sup>

#### (d) *Pathological*

The fourth and last category of causes of infant mortality are medical and pathological, that is, the exact physiological complication that rendered prolongation of life impossible. These causes are important in the sense that they indicate the background of conditions of heredity and environment and all their attendant factors which lead to death.

Here it must be repeated again that we do not have medical certification of all infant deaths for the growing registration area, for reasons discussed earlier. Nor is there post-mortem examination and analysis available for even a small number or a representative sample of all infant deaths in India. Writing on the question of recorded medical causes of death, the Bhore Commission pointed out: 'For improving the accuracy of the registered cause of death medical certification is necessary. In our view, certification of the cause of death should be a by-product, if we may so put it, of the normal functioning of an adequate medical service for the community, because a reasonably correct diagnosis of the immediate cause of death can be given only by a physician who has attended the patient during his last illness, while recording of the remoter causes of death will require, in addition, information regarding his medical history. No short cut can, therefore, be devised for promoting the rapid growth of a reliable body of information regarding the true causes of mortality in the community.'<sup>2</sup>

This is all very well, but under the present circumstances nearly 70 per cent of deaths at all ages go unattended by physicians. Therefore, the medical certification of death will not be available until the country as a whole and particularly the rural areas obtain a

<sup>1</sup> A discussion of this subject in some detail can be found in S. Chandrasekhar, *Population and Planned Parenthood in India* (London, Allen & Unwin, 1954).

<sup>2</sup> *Report of the Health Survey and Development Committee* (New Delhi, Government of India Press, 1946), p. 276.



modicum of medical services. Only then can the medical certification of death become a by-product of medical services.

In advanced countries, the pathological causes of infant mortality are reported on death certificates by physicians in attendance. These certificates therefore state the specific condition or disease that resulted in death. They are fairly reliable because the doctor has a statutory duty to supply a certificate and he has no special reason for making a vague or generalized statement. These may be malformation, congenital debility, enteritis, measles or any one of the infantile ailments which may prove fatal. But a plan to combat infant mortality cannot, of course, stop with mere pathological causes. The factors behind and beyond the pathological cause, that is, the predisposing and the antecedent factors, must be inquired into. These factors may range over a wide field, as pointed out already, from genetic qualities to customs and traditions affecting dress, diet and attitudes towards infants.

Difficulties, however, may arise in the statement of cause of death when vague concepts such as myocarditis or nephritis are used. This is particularly true when several factors have contributed to the death; it is rather difficult to establish the primary cause which is usually defined as that morbid condition which led directly to death. Besides this, doctors are sometimes led to be vague because they do not want to embarrass the relatives by the appearance in the public record of such conditions as syphilis.

In India, however, the situation is different. By and large, for all deaths, as already observed, medical certification of death is not available. In the case of infant deaths only a few major cities provide medical certification of death; even there the diagnosis is often perfunctory.

When diagnosed, how correct are these pathological causes? And can they be taken seriously? Even in relatively advanced countries such as the United Kingdom and the United States of America where adequate medical personnel, particularly pediatricians, are available, it has never been easy to establish the causes of infant mortality. On the basis of some experience gained in conducting an infant mortality survey in Newcastle upon Tyne, Dr. F. J. W. Miller writes:

'The difficulty of diagnosing disease in infancy is so great that no opinion could be given in 15 per cent of the whole series of 272 cases. This difficulty must be recognized and it must be accepted that, in contrast with adult medicine, so little is yet known of the clinical symptoms of disease in infancy that even after the fullest clinical and pathological investigation, the cause of death in many cases may not be discovered. The remedy is the establishment of adequate

facilities for research into the nature of disease in infancy, for even experienced physicians with extensive knowledge in disease in infancy are often at a loss to reach a diagnosis.

'Inadequacy of training in Paediatrics: the medical profession generally has undoubtedly received insufficient training in the care of the sick infant and the physiology and development of the healthy infant. This is because in England the subject has not been adequately supported by the teaching schools and there has been a lack of facilities both for training paediatricians and for giving adequate experience and post-graduate instruction to practitioners.

'Failure to call medical aid: the first symptoms of illness in infants are often so slight that parents, especially in poor circumstances, frequently fail to call medical aid till their child is gravely ill, moribund or even dead. Indeed in 27 of the 272 cases a report to the Coroner was required and many of these children had been found dead in bed never having had medical attention. Only in 2 cases was an autopsy held.'<sup>1</sup>

Despite these difficulties, some effort should be made to demarcate the areas of infantile ailments which prove fatal. We do have a few random samples of intensive inquiries of infant mortality in some small areas like a village, a health unit area or a maternity and children's hospital for limited periods ranging from one or two years to ten years or more for certain cities like Madras and Bombay. Even these figures and causes must be taken more as near-approximation than the exact truth for reasons of the unavailability of clinical histories, expert diagnosis and laboratory facilities. But the available information is sufficient to indicate the broad areas of infantile diseases which prove fatal.

It has been established that causes of infant deaths can be grouped roughly into two main classes, namely those dying within one month of birth (neonatal mortality) and those surviving the first month of life but dying before the first anniversary of their birth (post-neonatal mortality).

Deaths amongst the first class, the neonatal deaths, are due principally to prenatal and natal influences. The cause of many a neonatal death, in fact, is to be found far back in intra-uterine life, even at the earliest period of the individual's existence as a fertilized ovum. The second group, the post-neonatal deaths, covers those who have succumbed in the main to causes arising from postnatal influences such as the various epidemic diseases, diseases of the respiratory system, faulty feeding, poor hygiene and other environmental factors.

<sup>1</sup> F. J. W. Miller, 'Certification of Death in Infancy', *The Lancet* (September 5th, 1942), p. 269.

In view of the difficulties of the Indian situation, the causes for the first group are probably more easily ascertained than for the second group. For the first group they are: ill-advised pregnancies, in view of the health of the potential mother; frequent and ill-spaced pregnancies; absence of antenatal care; malnutrition and low vitality of the expectant mother to begin with, and malnutrition during her pregnancy; insanitary surroundings; absence of trained health visitors and midwives; the damaging and meddlesome mid-wifery of the *dai*; and last, maternal mortality itself as a cause of infant mortality.

The causes of mortality in the second group are more difficult to establish in the absence of statistics. However, statistics of a limited nature are available for some major cities where infant death returns by causes have been more or less obligatory. About nine cities have statistics for some of the years within the half-century under discussion and there are some random sample studies of infant mortality.

Of the former, the statistics of causes of death provided by the Bombay City Executive Health Officer for a number of years appear to be reliable in that they represent continuity of observation. A composite list from such statistics for a period of twenty-five years, 1925-50, is given below in the order of their percentage of deaths of infants due to these various causes, which are rather vague and would not satisfy the needs of modern social medicine, but it must be remembered that even in a city like Bombay infant deaths are not necessarily certified by a qualified pediatrician; the list, however, does give an indication of the infantile ailments that prove fatal in India. They are: infantile debility, malformation and premature birth; respiratory diseases; convulsions; diarrhoea and enteritis; smallpox; dysentery; measles; fevers, particularly malaria.<sup>1</sup>

To these must be added poor mothercraft and the woeful lack of general education in the expectant mother. Reproduction and motherhood are held to be natural processes but when they are beset by so much morbidity and mortality there appears to be something unnatural about them.

The Public Health Commissioner with the Government of India in his Annual Report for 1931 points out: 'In India, statistics of the causes of infant mortality are not recorded, but it is generally known that premature births, convulsions, fevers, malnutrition, respiratory diseases and bowel complaints are main causative factors in the death

<sup>1</sup> *Annual Report of the Executive Health Officer of Bombay City* (Bombay, for various years, 1925-50).

rate under one year.<sup>1</sup> In his Annual Report for 1934, the Public Health Commissioner states: 'The poor nutrition of the mother, overcrowding, a high birth rate and a high maternal mortality rate, frequent prematurity and the prevalence of respiratory diseases, convulsions, malaria and syphilis, combined with widespread ignorance of infant management — all contribute to the great loss of infant life in India. The birth rate, as also the infantile death rate, is high among the poorer classes, owing to the inaccessibility to them of efficient medical service.'<sup>2</sup> Thus, for the former provinces which constituted the general registration area till 1947, we have no statistics beyond intelligent guesses based on general practitioners' knowledge of the people and their health problems in and outside their homes.

A more reliable picture of the cause of infant mortality is provided by a recent inquiry undertaken by the Government of Madras to assess for a selected rural area the true infant mortality rate and the causes of infant mortality. The unpublished report of this inquiry is the most recent one carried out for a cohort of infants born during a period until they completed one year. The causes of death in this survey were determined on the basis of a detailed inquiry. 'On the intimation of death of an infant — arrangements for its immediate reporting were specially made — the Woman Medical Officer and the Health Visitor visited the party and, on intensive personal inquiry and examination of health conditions recorded at the previous visits, noted the cause of death to the best of their knowledge. The principle of sampling by inquiry method was adopted. Although the results may not be as accurate as in an ideal method, the results of the inquiry secured in the field conditions obtaining in rural areas in the State [of Madras] are sufficiently reliable for practical purposes.

'The causes of infant deaths were determined as pointed out above by inquiry soon after the occurrence of death and on examination of records of previous and present illness. Generally, inquiry was made within seven days and in several cases on the same day of death. In a few instances, the inquiry was conducted later than a week. It may again be repeated that no post-mortem examination was made, and that a more intensive inquiry enabling each infant to be observed every day during the first year could not be carried owing to the limitations set by funds made available.' An abstract of the causes of infant deaths is tabulated below:<sup>3</sup>

<sup>1</sup> *Report of the Public Health Commissioner with the Government of India* (New Delhi, Government of India Press, 1932), p. 72.

<sup>2</sup> *Ibid.* (1935), p. 73.

<sup>3</sup> H. M. Sharma, *Enquiry into Infant Mortality in the Poonamallee Health Unit Area* (unpublished manuscript. Madras. Director of Public Health, 1954).

TABLE NO 21. *Causes of Infant Deaths correlated to Age at Death in the Poonamallee Area, 1951-52*

Causes of Deaths	Age Group							Total
	0-24 Hours	1-7 Days	7-30 Days	1-3 Months	3-6 Months	6-9 Months	9-12 Months	
1. Birth Injury	1	2	1	—	—	—	—	4
2. Prematurity	5	7	5	2	1	—	—	20
3. Congenital Deformity	1	2	3	1	—	—	—	7
4. Gastro-Intestinal Infection	—	1	8	8	15	6	12	50
5. Respiratory Infection	—	1	5	9	5	1	2	23
6. Pyogenic Infection	—	—	1	3	2	—	2	8
7. Other Infections	—	—	1	3	3	—	1	8
8. Asphyxia	1	8	3	2	—	2	—	16
9. Malnutrition	—	—	2	6	4	4	1	17
10. Accident	—	—	—	—	—	—	—	—
11. Infective Hepatics	—	—	—	1	—	—	—	1
12. Debility	—	—	—	1	—	—	—	1
13. Causes Unknown	—	1	—	—	—	—	—	1
14. Virus Infection	—	—	—	—	—	1	—	1
	8	22	29	36	30	14	18	157

### *Maternal Mortality*

And last, the factor of maternal mortality itself as a cause of infant mortality is often ignored. But in an under-developed country like India where the incidence of maternal mortality itself is abnormal, its relation to infant survival must not be lost sight of. Perhaps the dominating factor affecting the health and welfare of the baby is the mother. In fact, in most cases, the very survival of the baby depends upon the mother. Her health, attitude, ability and understanding are directly concerned with the welfare of the baby. It is obvious that the death of the mother during labour or before the baby reaches its first birthday has a profound effect on its survival and welfare even in advanced societies; but in India the chances of adequate care and breast feeding for an orphaned baby are remote. Foster motherhood,

even when it exists in the family home, can seldom take the place of the 'natural' mother with all her care, attention and instinctive affection.

TABLE NO 22. *Causes of Foetal and Infant Mortality*

Stage	Period or Approximate Age	Causes
Prenatal	From 0 to 280 days	
Ovum	From 0 to 14 days	
Embryo abortion	From 14 days to 9 weeks	
(spontaneous)		
Foetus and induced)	From 9 weeks to birth	
Premature Infant	From 27 to 37 weeks	
Stillbirth	Average 280 days	Maternal Toxaemia Asphyxia Cranial Injury Maternal Syphilis
Birth	Average 280 days	
Perinatal mortality	Under 1 week	
Neonatal mortality	Under 4 weeks	Prematurity Congenital Debility Congenital Malformation Birth Injury Atelectosis Asphyxia at Birth Melana Neonatorum Other Causes
Post-neonatal mortality	Second to twelfth month	Measles Whooping Cough Diarrhoea and Enteritis Bronchitis and Pneumonia Influenza Accidents Diphtheria Scarlet Fever Gastric and Intestinal Disorders Respiratory Diseases Communicable Diseases Other Causes
Total Infant Mortality	Under 1 year	All the above

# The Fight Against Infant Mortality

## *More and Better Statistics*

A POLICY, whether in the field of economics or health, demography or medicine, presupposes an adequate knowledge of facts relevant to the subject. In the realm of public health and preventive and social medicine, it is not easy to obtain facts. They are not obvious to the naked eye and the necessary statistics can only be obtained through a complex, expensive and official organization where the reporting and recording are obligatory. And a government cannot embark on a policy of lowering the death rate of a community in an effective manner unless they have a reliable knowledge of the causes that are responsible for the high death rate.

Lord Keynes once observed that there is nothing a government hates more than to be well informed, for it makes the process of arriving at decisions much more complicated and difficult. Public administration in our country can be defined as the 'easy' art of reaching decisions on insufficient evidence. We must so change this situation that every decision of our Government is reached after a scrutiny of a vast body of objective, scientific and unimpeachable data.

The need for complete reorganization and streamlining of the present inadequate, inefficient and archaic system of vital registration is imperative. The country needs well-trained, well-organized and efficient personnel to staff a national network of rural and urban vital registration offices. The present state by-laws which are largely honoured in their violations ought to be replaced by a new code which would touch the imagination of the common man and strike a chord of sympathetic response. Vital statistics are usually a by-product of social services. If a citizen cannot admit his child into a free, tax-supported, municipal school unless he can produce a birth certificate, there will be a demand on the part of every parent for a birth certificate. But in India, there are no social services comparable to those in the West and nobody cares to inform the authorities of vital occurrences because the citizen gets nothing in return. No citizen anywhere has any great love for vital statistics for their own sake.

One is aware of the financial implications involved in streamlining

our registration system but that does not in any way lessen the great importance of adequate vital registration. Sampling studies, no matter now excellently designed, are no substitute for complete vital registration in a country of the size and variegated pattern of life of India.

In the case of infant mortality the need for adequate and authentic vital statistics — the number of infants born, the number of infants who die before reaching their first year and the causes of their death with all the attendant information — cannot be over-emphasized. The minimum information necessary in this connection has been discussed at some length in the first and second chapters and hence there is no need to repeat it here. In a word, without this basic and precise knowledge, no sound policy can be formulated to attack the present infant mortality situation in India.

### *Conception*

In India almost every pregnancy is a natural corollary of the married state. That is, pregnancies are accidents and not products of design. They are unplanned. If a pregnancy could result under ideal conditions, the wife should undergo a general medical examination to decide whether she is fit to become a mother. The fitness can be considered from several points of view — primarily physical, emotional and mental health, and secondarily economic and social. It is possible, though we have no direct evidence, that at least a tenth of all pregnancies that occur in India every year are undesirable in the sense that they are ill-advised from the point of view of the mother's health. The mother may be anaemic or weak, may suffer from some reproductive disorder or deformity, may have too large a family to have enough energy and leisure to cope with another baby, and last the strain on the slender family purse may be considerable. The problems here are the absence of limitation of family size and lack of spacing of children. If every pregnancy could occur under conditions that satisfy all the relevant factors, the infant mortality rate could be reduced to a very low and nominal figure — say 10 or 15 per 1000 live births. If family planning were to become a regular habit in the lives of every couple, this end could be easily achieved. If children can be spaced, say three years apart, the mother can successfully cope with the children and their necessary demands. Further, family planning must become efficient enough to limit the number of children to say three under normal, present-day circumstances. This would put an end to the present improvident maternity and lower not only infant mortality but also maternal mortality. We have sufficient evidence



to show that infant mortality is greater among families of improvident births where children arrive too often and too close to one another.

As a matter of policy, this question is receiving considerable attention in the country both at the governmental and the private family level. The Government of India and several State Governments (particularly Madras), it must be said to their credit, have taken a progressive stand on this question and are doing their best in not only educating the public on the need for family planning but also providing the necessary contraceptives and instruction in their use.

Today contraceptive advice is available in most Government General Hospitals, Maternity and Children Hospitals, a few private clinics and Red Cross Centres. But all told, these centres where regular contraceptive advice is provided are not more than a hundred and this number is confined to the major cities. The need for a national network of Family Planning Clinics staffed by women physicians or trained nurses, covering rural and urban areas, is obvious.

The Planning Commission set up by the Central Government has taken a courageous and progressive stand on this question. And during the Second Five Year Plan period, 2000 clinics in rural areas and 500 clinics in urban areas will be opened. Besides, Family Planning Training Centres have been opened in Madras and Bombay, the former under the State Government and the latter under the Central Government. Education and propaganda are going apace and it is hoped that within a decade or two contraceptive practices might spread among the younger married couples in both rural and urban India. Twenty years may be too short a period especially for rural India to take up seriously family planning but even here a real start can be made, for several attitude surveys have revealed that rural mothers are in favour of family planning. Already several successful attempts to promote family planning in the villages are being made and there is some reason to hope that eventually the unwanted baby in India might become as rare as a case of cholera in Sweden.

### *Antenatal Supervision*

Antenatal care in general has two primary objectives. They are, first, to conserve the health of the expectant mother in pregnancy, labour and the lying-in period, and, secondly, to enable her to produce a healthy child with the highest possible potentiality of developing into a healthy adult.

In view of these objectives, the antenatal clinics in the advanced

countries have been designed to provide certain specific services. These are to remove anxiety and fear of the expectant mother, especially when she is a primigravida, to diagnose and treat any early complications, to increase the proportion of normal deliveries, to lower the maternal morbidity and mortality rates, and last to reduce the incidence of premature births, stillbirths, perinatal and neonatal deaths. The antenatal services as provided in some advanced countries have covered a wide field. The expectant mothers are advised in clinics set up by local authorities, general practitioner clinics and home-visiting health visitors and midwives. As a result, these aims have been achieved to a large degree in the United States, Australia, New Zealand and in some countries of Western Europe. Their success is demonstrated in the striking reduction in overall maternal and infant mortality rates.

In India, these services are, by and large, absent. To begin with, expectant mothers in India, in general, do not feel the need for any antenatal consultation or supervision. They feel that their condition is 'natural' and such discomforts as they may have are the necessary 'price' of their condition. About 70 per cent of the expectant mothers live in rural areas where both an awareness of the need for consultation on the part of the mothers and the consequent demand for services are absent. And even where there is a demand, there are no antenatal clinics. There are no doubt a few clinics in large cities but they do not take care of even a small proportion of the needy expectant mothers. In major cities with corporations and in towns with municipalities, such care is being increasingly provided, of late, but the attendance is meagre and confined to those who have a positive complaint about their health. Visits to antenatal clinics whether in the Government General Hospitals or Municipal Dispensaries are not a matter of accepted routine. A smaller minority of enlightened and well-to-do expectant mothers in cities consult private physicians or specialists. We do not have, of course, any all-India figures on the strength of attendance at Government hospitals and municipal clinics and therefore there is no way of calculating the proportion of expectant mothers who receive antenatal advice and help. The need here is rather simple. Every community must provide what is called the domiciliary service, that is, physicians must examine expectant mothers and assure them that the confinement is likely to be normal. Should the examination reveal the possibility of complications, the mother-to-be must be referred to a hospital where the necessary arrangements for confinement with the aid of competent obstetrical care can be made. If the confinement is to be a normal one, a trained midwife can conduct the delivery in the expectant mother's home.

In the words of a recent British study on the general problems of maternity: 'The aim of the antenatal movement is to make contact with each expectant mother as early as possible in pregnancy and keep her under regular supervision, viz. monthly during the first four months, then fortnightly until the eighth month, and thereafter weekly until confinement.'<sup>1</sup>

The question of confinement poses, for our purposes, only two problems — the place of confinement and the nature of trained assistance during confinement.

Should the confinement be conducted in hospital or in the home? In the West, hospital confinement is generally the rule and home confinement the exception. In the United States of America in recent years, for example, more than 80 per cent of white babies and nearly 40 per cent of coloured babies were delivered in hospitals. In rural regions, however, home confinements constitute the majority. In India, the home confinement is the common practice and while there are no figures, a calculated guess would put these at 80 per cent of all deliveries. There is no reason why home confinements cannot be comfortable and safe, so long as the delivery is a normal one and the mother has received the domiciliary services. The home has certain advantages like domestic help by relatives, less or no expense, and sense of security arising out of the familiar surroundings and being in touch with the routine of a running home. On the other hand, certain familiar factors in the average home militate against home confinement. These are overcrowding and the attendant noise of a large family, lack of aseptic conditions and complete rest for the mother.

Institutional confinements overcome these difficulties and when the labour is expected to be abnormal the question of confinement at home does not arise at all.

Hospital confinement today is only for the urban mothers. The total strength of all the maternity wards in General Hospitals and maternity and children's hospitals cannot take care of all the births in our country. Nor is it possible even in the foreseeable future to provide such institutional beds to take care of some fifteen million babies per year. Nor is it advisable that the available limited resources of building, equipment and medical personnel should be diverted for this purpose.

Maternity and Nursing Homes might be the answer in our country. Today we have these Homes in all cities and some towns under private management staffed by competent physicians. This means of course that only those who can afford can enter these Homes. If a nation can have a chain of these Homes, registered and supervised

<sup>1</sup> *Maternity in Great Britain* (London, Oxford University Press, 1948), p. 29.

by the Government, with a capacity of not more than ten or twenty beds each, and subsidized by the local authorities, State or Central Governments, with minimum medical care, a considerable saving of infant lives can be effected.

The second and perhaps more important question is the provision of medical help to conduct the confinement. While difficult cases should receive the most skilled obstetrical care, the ordinary confinements can be conducted successfully by the general physician and often by a trained midwife alone. It is here that the country is faced with an intractable problem — the *dai*.

### *The Dai*

The *dai*, our untrained, indigenous midwife, poses a serious problem in any plan to reorganize maternal and child welfare services. The best course would be to stop her from carrying on her traditional task. But this is easier said than done and before she can be stopped, better and alternative services must be provided.

There are three alternatives open to the authorities: (1) to leave the *dai* as she is, (2) to register and train her, and (3) to replace her by a trained midwife. We cannot of course leave her as she is, for her ignorant, superstitious and unclean ways have all along been a danger to the community. The second alternative may be attempted for it is inexpensive. But it is rather difficult to train a middle-aged woman who is set in her ways. This also means that the midwives would be restricted to the under-privileged, low caste barber women. The third alternative should be the only acceptable way in modern India. Midwives should be recruited from the general population without any caste bias and with certain minimum educational qualifications such as a high school passing certificate. The ideal is to have one trained midwife for five villages or a rural population of about 10,000. We need in this connection an all-India Midwives Act on the lines of the Midwives Act of 1936 in the United Kingdom which will not only eliminate the untrained *dai* and forbid any untrained midwife to attend childbirth in any capacity, but provide an efficient midwifery service under the supervision of the Health Officer in urban areas and such rural Health-cum-Medical officers who may be appointed in the future in the rural areas.

### *Postnatal Care*

If prenatal care is important, postnatal care is equally, if not more, important. Postnatal care, unlike antenatal care, involves not only

the mother's own health, but the infant's and the mother's ability to take care of the infant.

The foremost requisite here is that the Government and the community set up Infant Welfare Centres where the mother can receive advice, assurance and some instruction to protect the infant from neonatal infection due to poor sanitary and hygienic environmental circumstances. The mother needs also to be enlightened in a higher and stricter antiseptic routine to guard the infant from all too familiar infections.

The second problem that most mothers are confronted with at this stage of infant development is that of feeding. Here the question is whether the infant should be breast fed or bottle fed. In all cultures breast feeding is natural and preferred to artificial feeding, so long as the mother's milk has not dried up for health or psychological reasons and breast feeding is possible. If the infant can obtain the necessary amount of nutrition through the mother's milk, half the battle is won. Mother's milk at the early stages need not be supplemented and the question of cleanliness and purity does not arise. Should the mother's milk fail or should the mother be unable to breast feed adequately for any reason, bottle feeding has to be resorted to. In India bottle-fed babies are exposed to numerous difficulties. Most mothers do not realize the imperative need for surgical cleanliness of both bottle and teat, and infantile summer diarrhoea in India has invariably been traced to the ubiquitous fly and its contact with the bottle or teat. Sterilization, or even careful washing with soap and hot water of bottles and teats is not an accepted procedure in most homes. The difficulty is one of both ignorance and poverty — ignorance of the utter need of cleanliness, and poverty which renders the purchase of the various well-known baby milk powders beyond the power of the mother and her family.

Even today, pasteurization of milk is undertaken in only a few cities in India and even there the cost of such milk is prohibitive. It can be asserted that nearly 90 per cent of the mothers who resort to artificial feeding have to use unpasteurized milk, often adulterated, and too expensive for most mothers to be able to afford an adequate supply of it for their infants. If a community can provide clean milk to infants (and if possible even free meals to nursing mothers), its infant mortality rate can easily be halved without any other measure. But the role of the Infant Milk Depot, providing pasteurized milk free or at nominal cost, in effectively lowering the infant mortality rate, as it has in European countries, has not yet been appreciated in India.

*Vaccination*

As for vaccination, there is a law on the statute books in India requiring compulsory vaccination of all infants against smallpox. Most city corporations and municipalities enforce this. A majority of villages also provide this service. But even today millions of infants escape vaccination in the remote villages and the law is largely observed in its violation. The extent of non-vaccination can be estimated by the incidence of regular smallpox attacks amounting to a minor epidemic every summer. It is sad to contemplate that, while the United Kingdom has made vaccination a voluntary matter, and years go by in Scandinavia without a single attack of smallpox, we in India should still be endeavouring in vain to vaccinate all our infants.

*Mothercraft*

Mothers need to be taught about infant care. In Indian homes, knowledge about bearing and rearing children is derived from a fund of folklore, traditionally handed down from mother to daughter. While there is no doubt that the folklore contains profound knowledge and robust common sense based on centuries of human experience, there are areas where this knowledge is at glaring variance with the scientific verdict. These areas cover infant feeding, clothing and treatment of common ailments. We need to educate every mother in the latest scientific findings about the most desirable methods of rearing infants to ensure their proper physical and emotional development.

Mothers in human society, unlike those in the animal kingdom, do not have any instinctive knowledge about infant care. Our knowledge is derived from accumulated experience. The only way of disseminating correct knowledge is through demonstration and the printed word. Demonstration implies clinics and doctors which mean in turn considerable expenditure, and the printed word means literacy and the reading habit, both of which are rather rare in our country. Some kind of school for young mothers (and later, for fathers as well) may be started. These schools could provide instruction in mothercraft on the soundest lines in keeping with the cultural traditions and needs of the community and country.

Above all, infant welfare and survival depend on what Sir James Spence calls 'mother's ability to cope with life'. It is true that a happy and stable family life must have as its basis three essential conditions — adequate housing, a reasonable income and a competent mother.

But of these the most essential condition is the competent mother. It is the mother and the home that are infinitely more important than all the infant welfare institutions and their medical personnel. Sir James Spence *et al.* in their survey of *A Thousand Families in Newcastle upon Tyne* writes: 'In the study of these families and in attempting to correlate their environments with the health of the children, there emerged one dominating factor — the capacity of the mother. If she failed, her children suffered. If she coped with life skilfully and pluckily, she was a safeguard of their health. In spite of lapses and failures, the mother stands out as the cornerstone of the family structure, and our experience confirms that in all sections of society she remains the chief guardian of child welfare, a fact which is sometimes in danger of being forgotten. A family with a good mother can withstand a feckless or even a vicious father but rarely can a family survive if the mother fails.'<sup>1</sup>

It is difficult to define this 'capacity of the mother'. Any attempt at definition can be more negative than positive. At one end of the scale we have stupid, ignorant and incapable mothers (some of whom are emotionally unfit to be mothers at all) and at the other end are those mothers who organize and run a home and bring up children with care, love and wisdom. In such happy homes where sickness is rare and infant mortality absent, the entire credit goes to the mother. The role of the mother in ensuring a happy and healthy family cannot be overestimated. And the point is that this 'maternal capacity' is neither instinctive nor hereditary. It is largely teachable.

### *Pediatric Services*

The inclusion of pediatrics in the medical curriculum is a recent feature. Infant diseases constitute a new field and the specialists in it are few. The total number of pediatricians today in India is not more than a hundred. Here is a pressing need for medical colleges to give greater emphasis to children's diseases and turn out more and competent pediatricians. While specialization is necessary, the future general practitioner must be taught and trained much more about childhood diseases, for often a family summons first a general practitioner when an infant becomes ill. The family doctor must also be a competent pediatrician.

<sup>1</sup> James Spence *et al.*, *A Thousand Families in Newcastle upon Tyne* (London, Oxford University Press, 1954), p. 120.

*Present Policy*

The Government are aware of the need not only to modernize the present maternal and children's health services but also extend them to areas where they are absent now. The Health Survey and Development Committee gave considerable attention to this question in their Report submitted to the Government in 1946. Since then the Planning Commission have given some thought to this question. They observe in their First Five Year Plan as follows:

Maternity and Child health is a service that is kept in the forefront in the planning of health programmes. The protection of the health of the expectant mother and her child is of the utmost importance for building a sound and healthy nation. The maternal mortality of India is very high and is estimated at 20 per thousand live births. Maternal morbidity is also very high being nearly 20 times the mortality. The infant mortality rate is of the order of 127 per thousand live births. The corresponding rates in progressive countries are very low and have been achieved by concentrated effort on the improvement of the health of the mother and child.

The lack of trained personnel like women doctors, health visitors, midwives, *dais*, etc., and of institutional facilities for training them add to the handicaps to provide an efficient service. The growth of maternity and child health work has been mainly through voluntary efforts and Governments and local authorities have taken it up only recently. Maternal and child health services should form an integral part of the general health services. Many of the States have developed the service in varying degrees, Madras, Uttar Pradesh, Bombay and West Bengal leading. It is essential to have on the staff of each Director of Health Services a specially trained woman medical officer. At present it is understood that only 9 States have got such organization at the headquarters of the States. In a very few States, women doctors are employed in both urban and rural areas. The pattern of organization for urban and rural areas may be considered separately.

While it is desirable to develop community centres which can cater to the needs of all members of a family and the whole community, such a development may not be possible except gradually. We have, therefore, to develop the ordinary type of maternity and child health centres. An adequate number of such centres properly equipped and staffed should be provided in all the urban health organizations. One centre with a minimum staff



of one health visitor, 2 midwives, a peon and a part-time sweeper to serve a population of 10,000 is recommended. In addition, there should be a woman doctor preferably with post-graduate training in maternity and child health to be in charge of these centres. There is ordinarily overcrowding in practically all the maternity hospitals and the number of maternity beds should be increased to double its present strength in order to accommodate more delivery cases and to give postnatal care for a longer period. Ten per cent of the maternity beds should be reserved for antenatal cases. It is also essential to reserve for children at least 10 per cent of the beds where there is no separate children's hospital with an adequate number of beds. Antenatal and post-natal clinics should form an essential feature of all hospitals with maternity beds. Provision should be made for day nurseries to look after infants and children of working mothers with the help of voluntary organizations or under the provisions of the Indian Factories Act. Private nursing homes established by doctors should be licensed.

In rural areas the present trend is to provide integrated curative and preventive health services and to organize them on the basis of health centres of different grades. There should be a unit for 10,000 to 12,000 population for efficient service. This will yield a total of 300 to 400 births a year. The maternity and child health staff in such a centre should be two midwives. A number of such primary centres would come under a higher unit for the Thana or Taluka. Here the staff for maternity and child health work should be a woman doctor and 2 health visitors. Their main functions would be training of *dais*, supervision of midwives and *dais*, care of maternity cases needing hospitalization and conducting the clinics in the different peripheral units. One of the important activities of health units in intensive development areas like the community projects is the provision of adequate maternity and child health services, both in the primary centres and at the headquarters of the project areas in the secondary centres.

All doctors engaged in maternity and child health work should have training in this branch of preventive medicine for a period of at least three months, and must have done a house job in an obstetrics department for at least six months. The practical training should cover both rural and urban fields. The period of field training will vary according to the total period the course covers. The department of maternity and child health of the All-India Institute of Hygiene and Public Health in Calcutta is to be expanded as a Centre for Postgraduate training for

maternity and child health doctors and for public health nurses with the aid of the UNICEF. Rural and urban training fields for nurses and midwives in the Delhi area and pediatric training centres in Madras, Bombay and Patna (Hyderabad is also under consideration) are being developed by the Government with WHO and UNICEF assistance.

Voluntary organizations have played an important role in the past. They were responsible for starting the training of *dais*, midwives and health visitors. Voluntary bodies have also been responsible for the establishment and maintenance of a large number of maternity and child health centres. But the responsibility for providing such services rests upon the Government. The activities of the voluntary bodies should supplement the functions of the Government. The Government should have power of supervision and control to ensure that health activities of voluntary organizations are maintained at a satisfactory level and they should extend the fullest support to these organizations. The provision made by the various States for maternity and child health work is Rs 1.35 crores and by the Centre Rs 53.48 lakhs.<sup>1</sup>

The Second Five Year Plan has given similar attention to the problem and schemes outlined in both the Plans are gradually being implemented. According to the Second Five Year Plan:

During the Second Five Year Plan it is intended to provide for larger hospital accommodation and to improve the services in hospitals, including staff, accommodation, equipment and supplies. For this purpose the plan provides about Rs 40 crores. It is estimated that in 1951 there were 8600 medical institutions in the country with about 113,000 beds; in 1955-56 the number of institutions is estimated to be about 10,000 with about 125,000 beds. These figures represent an increase during the first plan of 16 per cent in institutions and of 10 per cent in beds. At the end of the second plan the number of institutions is likely to be about 12,600 and the number of beds about 155,000 so that the increase expected is about 26 per cent in institutions and about 24 per cent in hospital beds.

The provision of rural medical and health care is the central problem in health planning. This object is to be achieved through the setting up of 'health units' in national extension and community projects. These units perform a variety of services and in their work curative and preventive aspects are

<sup>1</sup> *The First Five Year Plan* (Planning Commission, New Delhi, 1953), pp. 509-11.

integrated. During the first plan, in all 725 health units are expected to be set up. According to the tentative plans which have been drawn up and are now under consideration, it is proposed to establish over 3000 health units in community project, national extension and other areas. State Governments also propose to convert 131 of the existing dispensaries into primary health units and to set up a number of secondary health units.

The key to the extension of health services and their efficient operation is the availability of trained personnel in all categories. Training programmes have, however, to be linked with employment opportunities which are likely to become available. At the end of 1950 there were about 59,300 registered medical practitioners. The number had increased by the end of 1954 to about 67,000. It is estimated that by the end of the first plan there will be about 70,000 registered medical practitioners. At the rate of one doctor for every 5000 population at the end of the second plan about 80,000 doctors will be needed. Allowing for supervisory posts, the number of doctors needed will be about 90,000. That is to say, each year 4000 more doctors are required. The number of medical colleges has increased from 30 in 1950-51 to 40 in 1955-56 and the number of annual admissions from 2500 to about 3500 providing, at present, for a net annual out-turn of about 2000 doctors. State plans provide for the expansion of about 28 medical colleges and attached hospitals. The Central Government will assist the setting up of 6 new medical colleges and the establishment of full-time teaching units and of Preventive Medicine and Psychiatric Departments in medical colleges. Provision has also been made for completing the All-India Institute of Medical Sciences and upgrading certain departments of medical colleges for postgraduate training and research.

Shortages in personnel other than doctors have been more marked and are likely to persist longer than in the case of doctors. At the end of 1954 the numbers registered in different categories in the States were 20,793 nurses, 24,290 midwives, 756 health visitors, 4468 *dais* and 946 nurse-*dais*. As norms to aim at there should be one hospital bed for 1000 population, one nurse and one midwife for every 5000 population and one health visitor and one sanitary inspector for 20,000 population. For ancillary categories of personnel, figures in the last column in the table opposite are still somewhat distant. They illustrate, however, the character of the present shortages and the need for accelerated and sustained action if even elementary services are to reach the mass of the people in any adequate degree.

	1950-51	1955-56	1960-61	Number needed
Doctors	59,000	70,000	80,000	90,000
Nurses (including auxiliary nurse midwives)	17,000	22,000	31,000	80,000
Midwives	18,000	26,000	32,000	80,000
Health Visitors	600	800	2,500	20,000
Nurse-dais and dais	4,000	6,000	41,000	80,000
Health assistants and sanitary inspectors	3,500	4,000	7,000	20,000

During the second plan, an attempt is being made to achieve substantial advance in the provision of training facilities for different classes of personnel. Arrangements are being made for the training of nurses, midwives, pharmacists, sanitary inspectors and other technicians at medical colleges and at the larger hospitals which are not in use as teaching hospitals. There are at present six dental colleges in the country and they need to be more adequately staffed, equipped and housed. It is proposed to establish four new dental colleges and expand two existing colleges. The plan provides about Rs 40 crores for various training programmes. . . .

Maternal and child health programmes are proposed to be integrated with the primary health unit services. The plans of States provide for the setting up of about 2100 maternity and child health centres. At present pediatrics is the weakest link in the maternal and child health services. It is therefore proposed to start four regional training centres in pediatrics to give adequate training for medical as well as associated personnel in preventive and curative pediatrics. These centres will be associated with a number of properly staffed and equipped maternal and child health centres and will offer pediatric care in an area around the training centre.<sup>1</sup>

### Conclusion

All these suggestions for preventive, diagnostic and curative services appear simple, sound and familiar on paper and one wonders why they have not been carried out already in a country which is advancing in so many directions. The answer is lack of resources. It is true that our country cannot afford all the necessary social services in

<sup>1</sup> *Second Five Year Plan: A Draft Outline* (Planning Commission, New Delhi, 1956), pp. 151-3 and 155-6.

our present stage of economic development. When funds are limited, the question of priorities naturally arises. But it needs no elaborate argument to prove that *infant and maternal* services should receive the topmost priority, and their expansion to cover the entire relevant population should take precedence over anything else in the disbursement of public funds. We can close down our embassies and consulates abroad without any great loss but we dare not starve the health, medical and social services necessary for infants and mothers. It is a poor policy to neglect the mother of potential citizens and the infant who is the future citizen, who are after all the most powerful factors in the prosperity of a nation. It is on the mother that both the health and character of the nation depend. And the welfare of the nation in a real sense depends on the attention and care bestowed on the most defenceless and vulnerable section of our population — the mother and her infant.

However, it must be pointed out that the problem facing India on this question is not in any way unique and there is no need for pessimism. Every one of the modern advanced countries from Australia and New Zealand to Scandinavia and the United States have faced almost exactly the same problems, only about fifty years earlier. They have stumbled, pioneered and progressed and a vast knowledge of their experience is available to us. The necessary scientific knowledge in social and medical spheres to achieve an infant mortality rate of twenty or less is available today, but the major difficulty seems to be in bringing the available knowledge to every parent in the world and in removing the cultural obstacles in the path of accepting this knowledge. And scientific or social revolutions are not wrought overnight; but, even here, we have the requisite means to disseminate needed knowledge at all cultural levels through modern mass media.

Our efforts should be directed to the ideal of reducing the present inordinate infant mortality rate of about 120 per 1000 live births to something like 20. This may appear too ambitious in our present stage of socio-economic development, but this should be our target in the next ten or fifteen years.

The nation's children are too precious to be wasted by premature death or preventable disease.

# APPENDIX I

## Infant Mortality Rates

Year	Denmark	Norway	Sweden	Australia	New Zealand
1900	130	—	94	—	—
1901	136	91	—	104	—
1902	114	74	—	107	—
1903	114	78	—	111	—
1904	113	75	—	89	—
1905	120	82	—	89	—
1906	111	69	81	83	62
1907	108	66	77	81	89
1908	124	75	85	78	68
1909	99	70	72	72	62
1910	101	67	75	75	68
1911	105	65	72	69	56
1912	94	67	71	72	51
1913	92	64	70	72	59
1914	99	68	73	72	51
1915	93	67	76	68	50
1916	101	64	70	70	51
1917	99	64	65	56	48
1918	76	63	65	59	48
1919	91	62	70	69	45
1920	91	58	65	69	49
1921	77	54	64	66	48
1922	82	55	63	53	42
1923	85	50	56	61	44
1924	84	50	60	57	40
1925	80	50	56	53	40
1926	84	48	56	54	40
1927	84	51	60	55	39
1928	81	49	59	53	36
1929	83	54	59	52	34
1930	82	46	60	47	35
1931	81	46	57	42	32
1932	72	47	51	41	31
1933	68	48	50	40	32
1934	64	39	47	44	32
1935	71	44	46	40	32
1936	67	42	43	41	31
1937	66	42	45	38	31
1938	59	37	43	38	36
1939	58	37	40	38	31
1940	50	39	39	38	30
1941	55	43	57	40	30
1942	47	36	29	40	29
1943	45	35	29	36	31
1944	48	37	31	31	30
1945	48	36	30	29	28

## APPENDIX

## Infant Mortality Rate

Year	Denmark	Norway	Sweden	Australia	New Zealand
1946	46	35	27	29	26
1947	40	35	25	29	25
1948	35	30	23	28	22
1949	34	28	23	25	24
1950	31	28	20	25	23
1951	29	26	21	25	23
1952	29	24	20	24	22
1953	27	23	19	23	20
1954	27	22	19	23	20
1955	25	21	18	22	20

## APPENDIX II

## Religious Composition of India's Population (1951)

Community	Total Number (in millions)	Percentage
Hindus	307.1	84.99
Muslims	35.9	9.93
Christians (Protestants and Catholics)	8.3	2.30
Sikhs	6.3	1.74
Buddhists	0.22	0.06
Jains	1.6	0.45
Parsees	0.11	0.03
Tribal Religions	1.7	0.47
Non-tribal Religions	0.11	0.03

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